THE

GARDENS' BULLETIN

SINGAPORE

Vol. XII 7th December. 1949 Part 2

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GREGARIOUS FLOWERING OF THE TERRESTRIAL ORCHID BROMHEADIA FINLAYSONIANA

By R. E. HOLTTUM

It is well known that certain epiphytic orchids flower gregariously. Several authors have made detailed observations of the behaviour of the species *Dendrobium crumenatum,* which is one of the commonest orchids in Malaya, occurring on nearly every old tree and producing a beautiful but short-lived display of fragrant white flowers several times during the year. Other less common species of Dendrobium behave similarly. The flower buds of these plants develop underneath their protecting bracts to a stage at which all parts are formed, and then rest, sometimes for some weeks, before entering upon their final period of growth, which ends in flowering after a definite number of days. The stimulus which causes the buds to resume growth appears to be an unusually prolonged cool period, of a temperature comparable to that of normal night temperature. The literature concerned is fully cited by Kerling (1941).

Other orchids besides Dendrobiums behave in this way (and indeed the phenomenon is not confined to orchids, as the behaviour of Zephyranthes, investigated by Kerling, is essentially similar). The species *Bromheadia alticola,* belonging to a rather isolated and peculiar genus of Western Malaysia, has an elongating inflorescence of conspicuous 2-ranked bracts, which thus appears very different from that of *Dendrobium crumenatum,* but its flower-buds rest in a similar manner and respond to cool temperature in the same way, opening their flowers a day before *D. crumenatum.* There is a very common terrestrial species of Bromheadia which has indications of a gregarious flowering, but its behaviour is so different from that of the

other orchids already mentioned that I was doubtful if it could be a response to the same kind of stimulus. The results of my investigations of this terrestrial Bromheadia are here reported, and they are interesting as indicating a behaviour mid-way between uninhibited flowering and the peculiar condition of *Dendrobium crumenatum*.

Bromheadia finlaysoniana is very common in the scrubby vegetation which develops in Singapore on land that has been cleared and abandoned. It grows in association with Gleichenia, Nepenthes, *Gahnia tristis*, Melastoma, *Wormia suffruticosa* etc. The soil is often a hard compacted clay and it takes a considerable time for a vegetation of trees to develop. The plants of the long-persistent scrub are exposed to full sun, and most of them have tough leaves. The roots of the Bromheadia are close to the surface of the soil, so that they must soon feel the effect of dry weather, though they are protected by the shade of the other plants around them. A week without rain in Singapore is a dry period; two weeks is very dry; three weeks very rare. A few days without rain under the tropic sun are a strain on most plants which have not a deep soil to supply their roots with water.

Plants of *Bromheadia finlaysoniana* have erect leafy stems two or three feet high, with a terminal inflorescence. The floral bracts alternate in close succession, and the inflorescence continues to elongate for several months; its tip commonly bears three flower buds at different stages of development (Fig. 1). Each bud takes 20–30 days to flowering from the time when it is first visible beyond its bract; the interval between the times of opening of successive buds varies considerably. Each flower lasts one day only.

If the inflorescences and their buds on all the plants continued to grow at a uniform rate, one would expect a random flowering, with no great differences in the number of flowers to be seen on different days. But when we grew a number of Bromheadia plants together in one bed at the Botanic Gardens, we found that at irregular intervals of about 6–12 days there were a considerable number of flowers open together (the number varying much on different occasions) with few flowers on other days. It seemed that there was some influence at work causing gregarious flowering of an irregular nature, even though all buds appeared to be developing continuously. In order to understand the matter better, I measured the lengths of buds on selected inflorescences daily over a period of several months. I did this in 1940, the plants measured being grown in pots

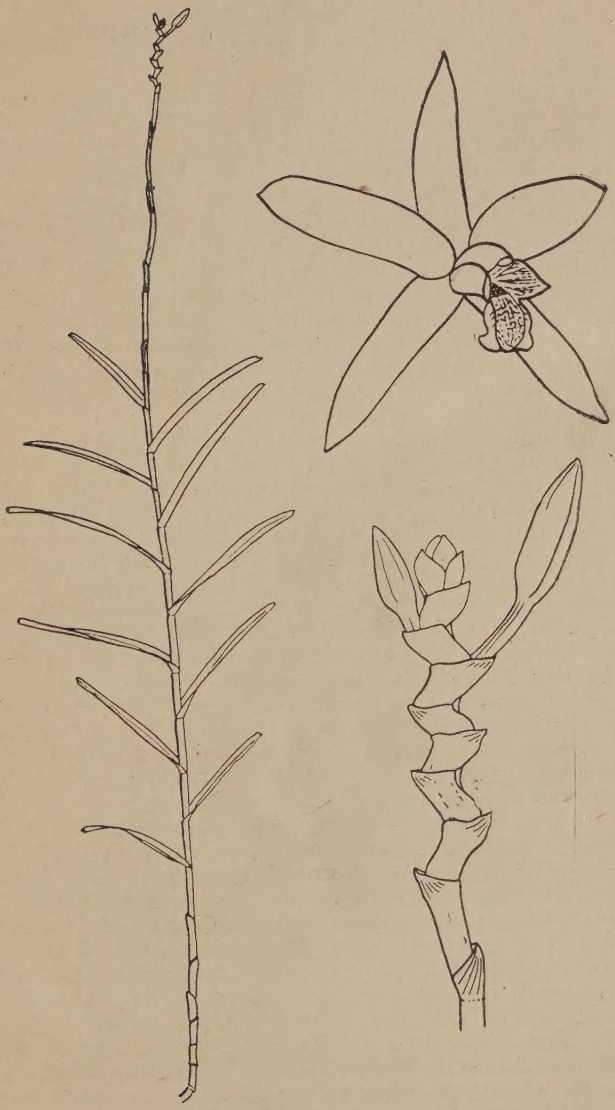

Fig. 1. On left, one complete stem of *B. finlaysoniana*, × 1/4. On right, inflorescence with 3 flower-buds at different stages (× 2) and an open flower (× 1).

and watered daily (except as noted below) and again in 1948 on some plants growing in a bed and receiving no water except rain.

In 1940 I measured 32 buds from their earliest visible stage to flowering, on five inflorescences (a few other buds fell prematurely). The time of development varied from 20 to 30 days, the mean time for buds on separate inflorescences varying from 24.5 to 25.5 days. The measurements were made to the nearest half millimetre, and included the total length of the bud with its ovary and short pedicel. Each bud showed an accelerated rate of growth, with a maximum on the last day, in which the increase in length was usually more than a centimetre. The measurements of 1948 gave similar results. In all, seventy-one flowers were measured over their complete development, on six inflorescences. The extreme periods of development were 19 and 34 days, the mean was 24 days.

When measurements of length of individual buds were plotted graphically, it was seen that some of them formed an even curve, showing a steady acceleration, while others showed retardation in part of the curve. The retardation usually occurred at lengths of 13 to 20 mm., and sooner or later gave way to normal accelerated growth for the six days prior to opening of the flower. It is thus evident that if several buds with retarded growth resumed normal accelerated growth at the same time, they might all flower simultaneously. In this way, buds which started to grow on different days might flower together (fig. 2). There can be no doubt that such retardation and subsequent resumption of normal growth is the cause of the gregarious flowering.

Two questions now arise. What causes the retardation of normal accelerated growth? And what causes the resumption of such growth after retardation?

My observations lead to the conclusion that there is not one single cause of retardation, and there is need of much further investigation before the matter can be fully understood. The following facts have a bearing on the matter.

In 1940, a potted plant under observation had its roots much exposed, owing to wash from heavy rain. I thought to help the plant by adding a little burnt earth (the usual potting soil) to cover the exposed roots, but this had a contrary effect. The plant (which had only one inflorescence) responded in a remarkable way. A flower-bud, which had attained 15 mm. in length and was developing normally, ceased growth on the day after the extra earth was added, and made no further growth, persisting 22 days before falling. A smaller bud, 5 mm. long, ceased growth and fell after only one day. This is clear evidence of a

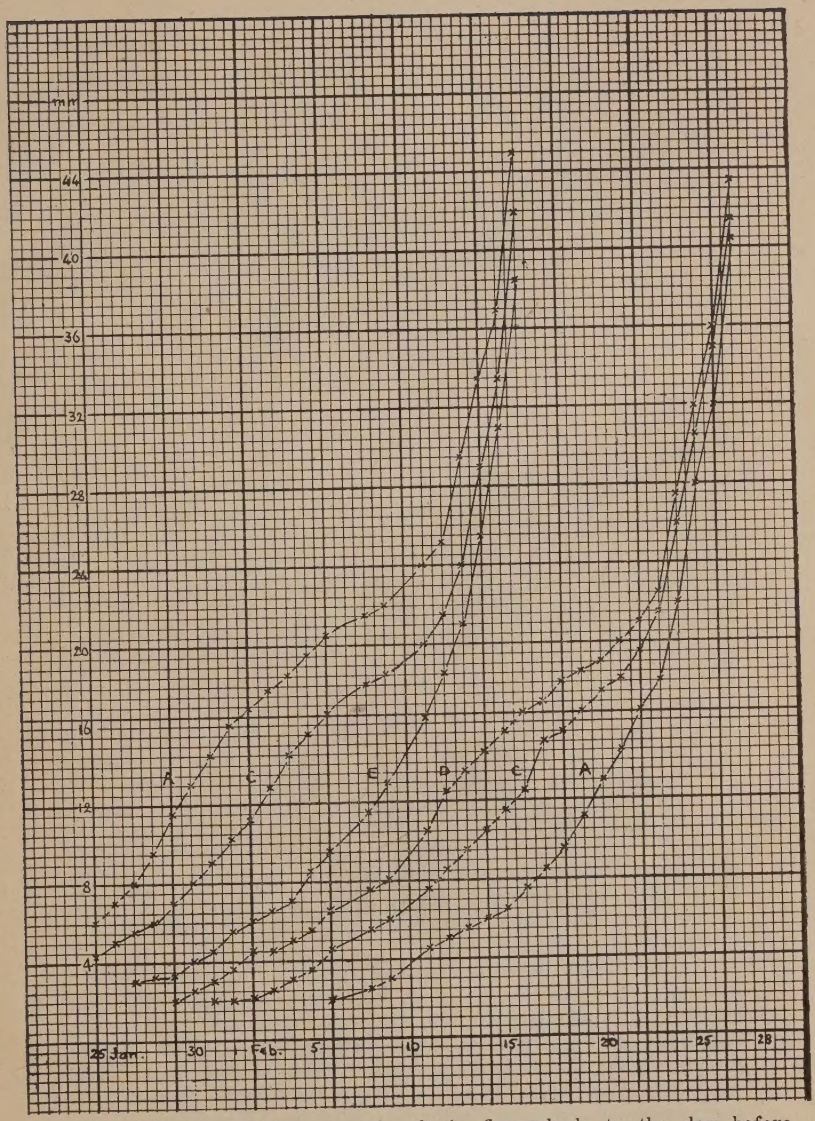

Fig. 2. Graphs showing growth of six flower-buds to the day before flowering. The left-hand group flowered on 17th February, the right-hand group on 28th February. Letters refer to the inflorescences on which the buds were borne; the first and last of the six buds were both on inflorescence A.

close association between root activity and flower-bud development. The roots were evidently injured in some way by the added earth; whether merely by depriving them of necessary exposure to the air, or by some directly harmful chemical effect.

Another pot was moved to a place where it was sheltered from rain (in good bright light, but not direct sunlight) and watering was stopped for 14 days. At the time watering ceased, 9 buds were developing. Of these, the four largest (one on each inflorescence) all flowered normally 2–7 days later. Two others, which were 5.0 and 5.5 mm. long when watering was stopped, grew to full development but failed to open; their final accelerated phase was less steep than normal, and their final size about two-thirds normal. A bud 4 mm. long grew about normally to 13 mm., and then grew less than another millimetre in five days, after which watering was resumed and normal accelerated growth to flowering occurred. A bud only 1.5 mm. long grew normally to 4 mm., remained at about this length for five days, and then resumed normal growth when watering was started again. There is no doubt that lack of water can cause retardation of growth, but also that accelerated growth (though of reduced amount) can occur even if water is seriously deficient.

In 1948 the plants were in a close group in the open ground, and were not watered. The month of February, 1948 was very wet throughout. Yet a number of buds showed retarded growth. It is well known that orchid plants resent unduly wet conditions (which prevent normal aeration of the roots) and I can only suppose that undue wet causes upset of normal root functions with consequent effect on flower buds. But this matter needs more experimental investigation. Retardation at later periods occurred in dry weather, but not always. The effect of drought on the root is not to be measured merely in terms of rainfall or its lack; it depends on many other factors, such as wind, atmospheric humidity, and duration of bright sunlight, and is difficult to assess.

Our other question seems to have a more definite answer. I have found that on every occasion when a considerable number of flowers were open on the same day (12 flowers or more, on about 30 inflorescences) the seventh day previous was decidedly cooler than average as judged by a thermograph record. I have not made any definite measurements of these records. Something more is needed than a comparison of maximum temperature, which may be of short duration. There was sometimes a sudden cooling due to a storm, such as that mentioned by Coster (1926),

but not always, and sudden cooling is certainly not essential. The results agree with those of Kerling already mentioned for Zephyranthes and Dendrobium.

It seems then that flower-buds of *Bromheadia finlaysoniana* grow to about 12 mm. in length, and then for the next week or so are susceptible to retarding influences which may extend over a period of as much as eight days but usually over a lesser period. When the plant experiences the next unusually cool day, the normal accelerated development begins, and flowering occurs on the seventh day. Under normal conditions, the retardation does not amount to a cessation of growth, but such might occur (as in the unwatered pot) under exceptionally dry conditions.

It is not a big step from such a condition to that of *Dendrobium crumenatum*, in which growth ceases altogether at a certain stage of development, to be resumed as a result of a cool-temperature stimulus. The significance of the cool temperature stimulus probably is that such temperatures are usually associated with wet days; and water is necessary for the rapid later stages of development of flower-buds. (In Zephyranthes it has been shown that both cool temperature and water are necessary as a stimulus to growth of dormant flower-buds). The terrestrial Bromheadia is somewhat better off as regards water supply than the epiphytic Dendrobium, so that a total cessation of growth of buds until rain comes may be unnecessary. The Bromheadia is evidently also sensitive to a less pronounced cool-temperature stimulus.

All other species of Bromheadia except one are epiphytic, and it seems possible that *B. finlaysoniana* is "secondarily" terrestrial; *i.e.* that it is derived from epiphytic ancestors. Its roots are of epiphytic type. Whether under such circumstances its behaviour as regards bud-development could be a regression from the epiphytic condition (shown by *B. alticola*) or whether it is an arrested stage of evolution, is an interesting matter for speculation.

Some buds of *Bromheadia finlaysoniana* develop quite evenly, with no trace of retardation. Whether a bud always does this if root conditions are satisfactory, or whether such buds always experience a cool day at the right stage of their development, is a matter for further observation. The whole behaviour of flowering in this species is an indication of extreme sensitiveness to external conditions, and is an interesting example of how plants in our apparently very uniform climate can respond to small climatic changes.

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THE SELECTION OF TYPE-SPECIES OF SOME OLD GENERA OF FERNS

By R. E. Holttum

Some early genera of ferns are so heterogeneous that the authors cannot have had clear ideas in founding them. It is sometimes possible to exclude certain species as not conforming to the author's generic description, but it is often not possible to say that one species rather than another is clearly indicated by that description. The generic description is thus not an infallible guide in the selection of a type-species.

The usual procedure has been to follow the first author who divides a genus. The process may be repeated more than once. Often the authors who split genera did not indicate a type-species; one can only agree that the type-species must be contained in that part of the original genus which is retained under the original generic name.

It may occur that subsequent authors in dividing a genus do not pay attention to the original generic description, and so may retain under the original generic name a species that does not well agree with that description, removing all others to another genus or genera. In such cases it may seem reasonable to select a new type-species of the original genus. But if (as often happens) none of the original species correspond uniquely to the description, there may well be difference of opinion as to which species most nearly corresponds to it. The result will be confusion. I suggest that, in the interests of uniformity of nomenclature, it is better to follow the first divider of a genus, even though he may not select (by implication or otherwise) a type-species that most nearly corresponds to the original description. This may not be ideal arrangement; but in practice no ideal arrangement is possible, and I suggest that it is better to follow a definite rule rather than an indefinite one which will allow of differences of opinion and, as a result, confusion of nomenclature. On the other hand, there should certainly be a recommendation that a later author, in dividing a genus, should principally consider the generic description when selecting a type-species.

Linnean genera can be treated like any others, having regard to the convention that the species described in 1753 are associated with the generic descriptions of 1754, and to the rule that legitimate nomenclature begins in 1753 (art. 20).

I apply these principles to the names of certain fern genera as follows:

1. **Pteropsis** Desv. 1827.

This genus included five different genera, by modern standards. The species which most nearly agrees with the original generic description is *Pteropsis scolopendrina,* which is a Vittaria (an earlier genus). It is therefore reasonable to regard Pteropsis as a synonym of Vittaria, and this is actually the effect of the action of the botanists who have in succession removed from Pteropsis the following: Drymoglossum Presl (1836), Paltonium Presl (1849), Eschatogramme Trevisan (1851), Ananthacorus Und. & Maxon (1908). I see no reason why *Pteropsis piloselloides* should be chosen as type-species of Pteropsis. It does not well agree with the generic description, and after Presl separated it in 1836 no botanist appears to have restored it to Pteropsis until Underwood and Maxon in 1908.

2. **Trichomanes** Linn. 1753.

In Species Plantarum 1753 eleven species are included in this genus. The generic description of 1754 would apply equally to *T. crispum* and to *T. scandens,* and there is nothing in the publications of 1753 and 1754 which would indicate one rather than the other as type-species of the genus.

The 19th century botanists who subdivided Trichomanes all agreed in leaving in it *T. scandens* and its near allies. Moreover, these are admitted by Copeland to represent a primitive and unspecialized section of the genus Trichomanes *sens. lat.*

But Copeland in 1937 (Philip. Journ. Sci. 67: 51) proposed a new generic name Vandenboschia for *T. scandens* and its near allies, on the ground that the type-species of Trichomanes is *T. crispum,* which he considers to typify a genus distinct from *T. scandens.* The reason for the selection of *T. crispum* as type-species is that it was the first species described as Trichomanes by Linnaeus, in 1737. But legitimate botanical nomenclature begins in 1753, and there is nothing in the Rules which instructs us to refer to earlier literature. We are in fact referred to generic descriptions of 1754. It is true that in the case of Trichomanes, reference to an earlier work gives us a single original species of our genus. But it would not always do so; and the obligation to search all literature earlier than 1753 in order to find the first species in each genus as understood by Linnaeus in 1753 would not only add greatly to the present amount of purely bibliographical work of taxonomists; it would also present many new problems which

would allow of differences of opinion. The result would not be conducive to stability of nomenclature, and would involve the expenditure of much effort which would be better directed to the study of the plants themselves.

I therefore contend that the type-species of Trichomanes should be *T. scandens*, not *T. crispum*, and that the generic name Vandenboschia Copel. is superfluous.

3. **Belvisia** Mirbel 1802.

When originally describing this genus, Mirbel discussed its relation to Blechnum, to Pteris and to *Asplenium septentrionale*. All species included by Mirbel in his new genus, except *B. spicata*, had compound leaves, and from his discussion it is clear that he regarded *B. spicata* as an aberrant member of the genus. *B. spicata* is however the only species left in Belvisia after the other species have been removed to the older genera Blechnum, Pteris and Asplenium. Therefore, though it does not agree best with the generic description, I agree to accept it as the type-species of the genus.

As the name Hymenolepis Kaulf. is illegitimate, being a later homonym of Hymenolepis Cassini, Belvisia takes its place, being the next generic name in order of priority.

4. **Thelypteris** Schmidel 1762.

Copeland, in Gen. Fil. pp. 135–136, rejects Thelypteris on the ground that it was not validly published by Schmidel. Alston had previously commented as follows on this subject (Kew Bull. 1932: 309):

> It has been argued (Mackenzie in Am. Fern Journ. XVII, 117–119) that Schmidel was making use of a uninomial nomenclature; this is clearly untrue, as he uses the name Commelina for three distinct species. That Schmidel regarded his names as generic is clear from p. 104 where he speaks of Micheli's genus Sphaerocarpus. That Schmidel considered his genera to be published is apparent from his proposal of a new genus (Tegamum, p. 67).

Copeland objects that Schmidel's name *Thelypteris non ramosa* distinguishes it "not from Acrostichum of Linnaeus but from the older Thelypteris which we know as Pteridium". Schmidel was in fact reviving a genus published by Ruppius in 1718. The two species in that genus were *T. dioscoridis* (= Pteridium aquilinum) and *T. palustris non ramosa*. Neither belongs to Acrostichum, and there was nothing wrong in Schmidel maintaining a genus for them; the fact that we now consider them to belong to two different genera is irrelevant. Schmidel

published a long description and an excellent plate. It is a better basis than that of many fern genera, and I consider it to be valid.

5. **Ctenopteris** (Blume) Kunze 1846.

The name Ctenopteris was published by Blume in 1828, in a conspectus of the sections of the genus Polypodium. The preceding section (Goniophlebium) is clearly indicated as such; but of Ctenopteris Blume remarks that it is sufficiently distinct to warrant separation as a genus. He does not however make the separation, nor use the name Ctenopteris when later describing the species concerned. It is clear therefore that he was in effect describing a section of Polypodium, not a new genus. The first author to take up Blume's name and to publish binomials under it was Kunze (*Bot. Zeit.* 4: 425. 1846). Kunze did not describe the genus, but referred to Blume's description, so validating Ctenopteris as a generic name.

Different authors would define differently the limits of Ctenopteris. In Blume's original list are species with both superficial and immersed sori; and one of the latter (*C. venulosa*, type also of Cryptosorus Fée) is chosen by Copeland as the type-species. It may be contended that there is no sharp distinction between *C. venulosa* and the genus Prosaptia Presl (1836). It is also clear that Xiphopteris Kaulf. (1820) is a closely allied genus which might not unnaturally be united to Ctenopteris. (J. Smith placed *Polypodium trichomanoides*, which is a Xiphopteris, in Ctenopteris).

I consider that, if Ctenopteris, Prosaptia and Xiphopteris are united, Ctenopteris is the most appropriate name, Xiphopteris and Prosaptia referring to special characters not shared by the whole group. I have therefore proposed the conservation of Ctenopteris to have precedence over Xiphopteris and Prosaptia whenever either of these is united to Ctenopteris as typified by *C. venulosa* (Bl.) Kunze.

THE STATUS OF BOTANICAL LITERATURE PUBLISHED BEFORE 1753

By R. E. Holttum and C. X. Furtado

In a recent paper, Chatterjee (1) criticizes a contention by Furtado (2) that botanical literature published prior to 1753 should be regarded as invalid. In our opinion, Chatterjee omits certain relevant considerations, and a further statement on the subject is therefore desirable.

Chatterjee objects to the use of the term valid and its derivatives by Furtado, and also to certain other "unfamiliar" terms, but he does not mention that Furtado has defined the use of these terms (3, 4), nor does he seem aware of the inconsistent use of the terms valid, legitimate and their derivatives in the Rules. Chatterjee himself is not consistent in his use of these terms.

As an example of the confusion that exists, we may quote the following possible argument, using a strict verbal interpretation of the Rules. Under Art. 36, literature published prior to 1753 may be regarded as effectively published, and under Art. 20 legitimate botanical nomenclature begins with Linnaeus' Species Plantarum of 1753; then by the application of Art. 19 and Art. 37, names published before 1753 are illegitimate but validly published (not invalidly, as maintained by Chatterjee); therefore under Art. 61 many Linnean names (which it is the intention of Art. 20 to conserve) become unusable as homonyms.

Basic to all Furtado's work is an attempt to define necessary terms, so that the Rules shall not be ambiguous; he has further attempted to clarify the Rules by bringing together those Rules which deal with the same subject. Much argument about the Rules is due to the lack of clear thought about the use of the terms concerned, and to the lack of logical sequence in the present Rules.

Chatterjee does not mention that Furtado's paper (2) deals with generic names, nor does he mention those parts of Art. 20 and Art. 42 which deal with generic names. Art. 20 states that it is agreed to associate the generic names which appear in Linn. Sp. Pl. ed. 1 (1753) and ed. 2 (1762–63) with the first *subsequent* descriptions given under those names in Linn. Gen. Pl. ed. 5 (1754) and ed. 6 (1764). Art. 42 states that the generic names of Sp. Pl. ed. 1 and ed. 2 are treated as validly published in those works. If these statements are not intended to indicate that Linnean generic names are not validated by reference to literature

published before 1753, what do they mean? And if such a rule applies to Linnean generic names, surely it should apply also to other generic names.

Prior to the Vienna Congress, the rule about names was "each natural group of plants can bear in science but one valid designation, namely the most ancient, whether adopted or given by Linnaeus or since Linnaeus, provided it be consistent with the essential rules of nomenclature". For generic names, it was then customary to refer back to Linnaeus' Genera Plantarum of 1737; some botanists even thought that Tournefort's work should be made the starting point for them. It was the work of Otto Kuntze which showed the enormous changes that would result if an attempt were made to find the most ancient use of a name, and it was because of this that the Vienna Congress of 1905 passed the rule making Linnaeus' Species Plantarum, first edition, the starting point for names of genera as well as species.

We contend that it was the intention of the Vienna Congress to make 1753 a starting point, and to rule out of consideration everything before that for purposes of name-validation. The rules which the Congress made concerned generic names, because the concept of a genus, and many generic names, existed before 1753, whereas the bulk of binomial names for species did not exist before 1753. Therefore special rules for generic names were necessary. It was recognised that Linnaeus changed the application of many generic names (so that his own names are later homonyms), and it was intended to regularize the position and prevent further argument.

It is true that the Rules do not specifically say that literature prior to 1753 is invalid. But in fact almost all botanists of the 19th century (except Otto Kuntze and any who followed him) regarded 1753 as a starting point, and did not recognize references to pre–1753 literature as validating names. It was only in the present century that this practice began. Chatterjee states that Prain was the first modern author on East Asiatic botany to validate a binomial by reference to Rumphius; but if he refers to Prain's publication of the name *Sindora galedupa* he will find an excellent diagnosis in which *S. galedupa* is distinguished from all other members of the genus; it is this diagnosis which validates the name, and the case is totally unlike those of Burman's Index and Stickman's list, which merely refer to Rumphius without any discussion or diagnoses.

Furtado has shown (2) the appalling complications which can ensue if references to pre–1753 literature are regarded as validating names; this discussion again is not

mentioned by Chatterjee. We contend that the intention of Arts. 20, 42 and 44 is to prevent such complications. Chatterjee himself admits that the practice is undesirable, and proposes that future authors should be recommended to cease the practice. We should prefer to see the recommendation made into an explicit prohibition by a change in the Rules such as that already proposed by Furtado (4, p. 14).

Furtado contends (and this again Chatterjee does not mention) that reference to pre–1753 literature should have the same status as manuscript notes in herbaria, or as herbarium specimens; a name cannot be validated by reference to notes or specimens. It appears to us that Prain also adopted this attitude to the plate and description of Rumphius which he cited; he used them as evidence only, and did not regard his citation of Rumphius as by itself validating his name.

Now we come to the special case of the interpretation of Linnean names. This is of fundamental importance, and it is not properly discussed in the Rules. It has many difficulties, and there is great need for a clear statement of correct procedure. We believe that proposals for such a statement are now being prepared; they are long overdue. We cannot here fully discuss this complex problem, but we make the following observations.

As Chatterjee points out, the descriptions accompanying most Linnean names are not adequate to characterize the species concerned. They must be interpreted by consideration of the figures quoted by Linnaeus, and also by the specimens which Linnaeus had at that time in his herbarium, or which he saw in other herbaria. These figures and specimens (which Furtado (5) calls the syntypes of a Linnean species; one can speak similarly of the syntypes of a Linnean genus) explain to us what Linnaeus meant, and give his name a meaning. The name is valid (in Furtado's sense) because we agree to start nomenclature with Species Plantarum edition 1 of 1753, and for no other reason; Linnaeus explained his names (and therefore made them usable, or valid in a different sense) by quoting figures and referring (often implicitly) to specimens. The case of *Cyclamen indicum*, quoted by Chatterjee, in which the figures cited by Linnaeus are incomprehensible (and possibly inaccurate) and no specimens exist, shows how useless the process of "validation" by reference to ancient literature may be.

The principle of priority is not an end in itself. It is a means to an end, and the end is stability of nomenclature. Many early names cannot be typified with absolute certainty. Therefore botanists are apt to disagree about their typification, and stability is lost. We submit that Furtado's

interpretation of the intention of the Rules would eliminate the possibility of a great deal of fruitless argument about the status of ancient names, and thereby free botanists to attend to much-needed monographic work on the vast number of tropical plants which are still unknown or very imperfectly or even inaccurately described.

Old names must be given precise meaning by study of type specimens or by other means; otherwise their use leads to confusion. But if there is insufficient evidence for a precise typification of such names, we submit that it is much better to ignore them altogether. Unless the evidence is clear, there is room for argument, and to difference of interpretation, with resultant instability of nomenclature. It was to eliminate such uncertainty and instability that the present Rules about generic names were made. We believe that these rules should be more strictly defined in the sense proposed by Furtado, and that this would lead to a greater stability of nomenclature.

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A FURTHER COMMENTARY ON THE RULES OF NOMENCLATURE

By C. X. FURTADO,
Botanic Gardens, Singapore

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3. Condensation in the Rules.
4. The Variety Typica.
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6. Priority of the Names of Generic Sub-divisions.
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25. The Fallacies of Implicit References.
26. Alternative Names and the Will of the Congress.
27. Responsibilities of Publishers.
28. Orthography of Names.
29. Tautonyms and Generic Homonyms.
30. Proposed Amendments to the Rules of Nomenclature.

1. Introduction

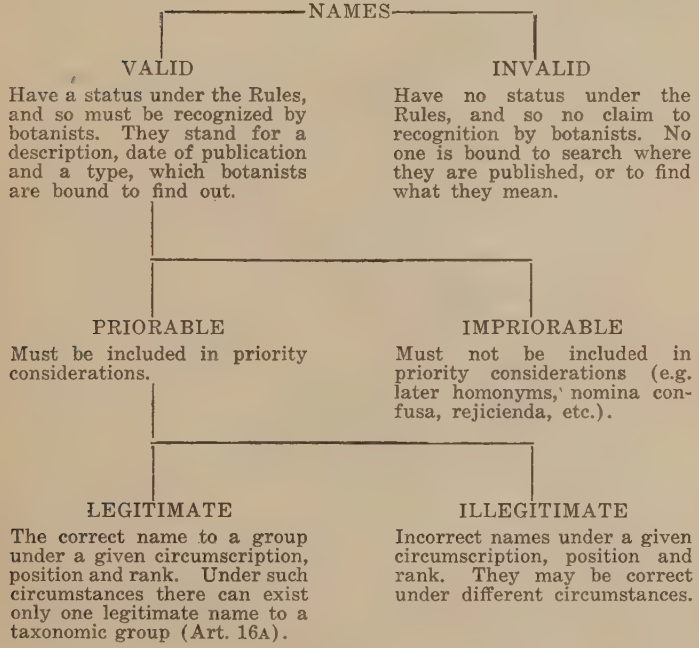
In my previous commentary on the laws of botanical nomenclature (Gard. Bull. Straits Settl. IX, 1937, pp. 223–284), an attempt was made to clarify a number of provisions which appeared vague or inconsistent in the 1935 Rules. Later some amendments were proposed by me for consideration at the 1940 Botanical Congress on points that appeared to me the most essential for future progress (Gard. Bull. Straits Settl. XI, 1939, pp. 1–30). However, I venture here to issue a complementary set of proposals and a commentary in the hope that the philosophical basis of nomenclature may receive due consideration in the revision of the Rules at the 1950 Congress. I submit that the time has come when botanists should pause to analyse first the principles involved in the system of the rules as a whole and then examine the different rules accordingly.

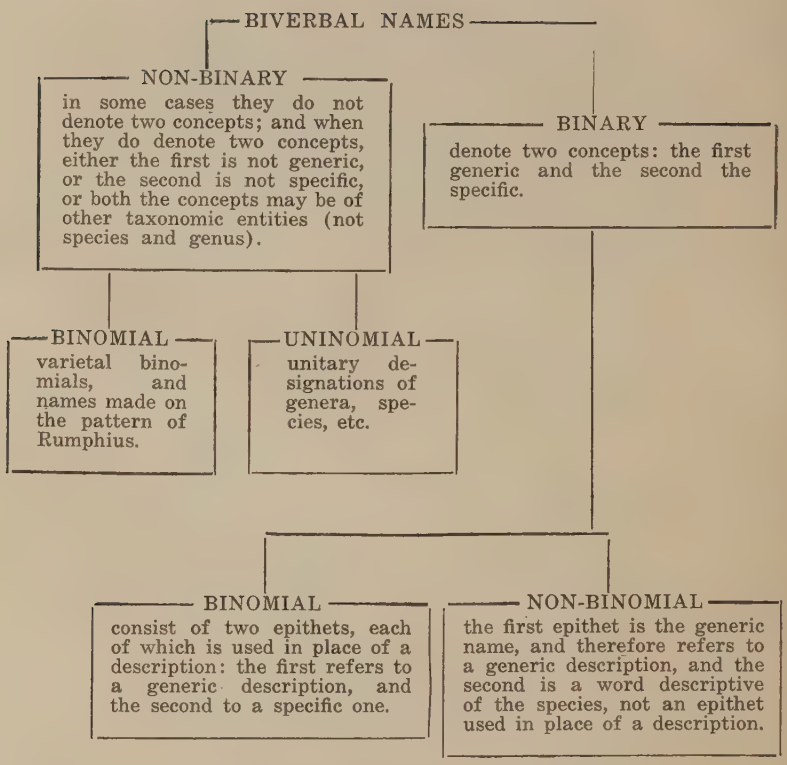
I propose therefore that a special Committee be appointed to consider in detail the principles involved. Should this Committee agree to a principle, but not to the location or the form of an amendment embodying the principle—two reasons why a good proposal may be rejected —the Committee should be empowered to suggest a better place and/or better wording so that the principle might be incorporated in the code.

2. Certain Elementary Distinctions

There is little objection to the use of a word in more than one sense, though fallacies may be lessened by using differential terms; but what is disastrous is that any word should change its sense during a discussion without our being aware of the change. In a code of rules, therefore, the multiplication of distinctions by proper definitions is essential in order to prevent the misapplication of the rules themselves. Thus, much confusion has been caused by the equivocal use of the terms *valid, legitimate* and their antonyms (Furtado in Chronica Botanica V, 1939, pp. 214–215, and in Gard. Bull. Straits Settl. XI, 1939, p. 24 and Arts. 2B, 16A, 19A and 61B), as well as in the use of the terms *binary, biverbal* and *binomial* (Furtado in Philipp. Journ. Sc. LXIX, 1939, pp. 467–469 and in Bull. Jard. Bot. Buitenz. XVI, 1939, pp. 116–119). As a result the entire legislative body has sometimes been misdirected at Botanical Congresses, leaving the taxonomist in uncertainty as to the application of certain rules which previously had been considered clear and straightforward (see also Furtado in Philipp. Journ. Sc. LXX, 1939 pp. 197–199).

In view of this I submit that the distinctions existing in the most elementary terms *binary, biverbal, binomial, valid, priorable,* and *legitimate* with their antonyms might be incorporated in the body of the Rules themselves. This will oblige botanists to consider these distinctions in applying the different provisions in the Rules. I append here a tabulated analysis so that the distinctions may be clearly borne in mind in appreciating the discussions and the proposals that follow.


NAMES
VALID
Have a status under the Rules, and so must be recognized by botanists. They stand for a description, date of publication and a type, which botanists are bound to find out.
INVALID
Have no status under the Rules, and so no claim to recognition by botanists. No one is bound to search where they are published, or to find what they mean.
PRIORABLE
Must be included in priority considerations.
IMPRIORABLE
Must not be included in priority considerations (e.g. later homonyms, nomina confusa, rejicienda, etc.).
LEGITIMATE
The correct name to a group under a given circumscription, position and rank. Under such circumstances there can exist only one legitimate name to a taxonomic group (Art. 16A).
ILLEGITIMATE
Incorrect names under a given circumscription, position and rank. They may be correct under different circumstances.


BIVERBAL NAMES
NON-BINARY
in some cases they do not denote two concepts; and when they do denote two concepts, either the first is not generic, or the second is not specific, or both the concepts may be of other taxonomic entities (not species and genus).
BINARY
denote two concepts: the first generic and the second the specific.
BINOMIAL
varietal binomials, and names made on the pattern of Rumphius.
UNINOMIAL
unitary designations of genera, species, etc.
BINOMIAL
consist of two epithets, each of which is used in place of a description: the first refers to a generic description, and the second to a specific one.
NON-BINOMIAL
the first epithet is the generic name, and therefore refers to a generic description, and the second is a word descriptive of the species, not an epithet used in place of a description.

3. Condensation in the Rules

In the 1935 Rules, provisions concerning a particular subject are unnecessarily scattered in different Sections and in different Chapters so that this diffusion has frequently confused even experienced nomenclaturists. To give an instance of the confusing way one has to wade through the Rules in order to find whether or not a name is correct, I quote the following from two acknowledged nomenclatural authorities:—

"*Abies taxifolia* Poir. was actually a new combination for *Pinus taxifolia* Lamb. (1803) non Salisb. (1796), and as such invalid, but as a new name it is valid under Art. 69, since Poiret was at liberty to adopt the epithet *taxifolia* although it had previously been given to the species in an illegitimate combination." (Sprague and Green, The Botanical Name of the Douglas Fir, in Kew Bull., 1938 pp. 79–80).

That is, a name which was "actually a new combination" and "invalid" under one rule becomes "a new name" and "valid" under another. Yet we are told that "names and forms of nomenclature contrary to a rule (*illegitimate* names or forms) cannot be maintained." (Art. 2). Under this definition in Art. 2, therefore, *Abies taxifolia* Poir. should be considered illegitimate and unusable if the arguments brought forward by SPRAGUE and GREEN were accepted as correct. (Note also that the use of the word "valid" by SPRAGUE and GREEN is not in accordance with its definition in Art. 16). If this case were considered under the strict wording of Art. 54, another interpretation is possible, though overlooked by SPRAGUE and GREEN. Under this Article, it looks as if POIRET was obliged to adopt the epithet *taxifolia* when he transferred *Pinus taxifolia* Lamb. to *Abies;* for there was not available for the species an earlier validly published epithet, nor was the resulting combination a later homonym or a tautonym—the only two obstacles under which Art. 54 allows a different epithet to be used for a species when transferred from one genus to another (see also Furtado in Gard. Bull. Straits Settl. XI, 1939 p. 24 sub Art. 53A and in Fedde, Repertorium XLIV, 1938 p. 244–255).

In view of this misleading diffusion in the Rules, I plead again for a rearrangement so as to keep all the provisions pertaining to one particular subject together.

4. The Variety Typica

A botanist who wishes to make one and the same specimen the basis of a species, variety, and subvariety at the same time, yet wants to keep the infra-specific epithets under the same binomial, will naturally (in this particular case) make our system polynary, polynomial and polyverbal, though only in form; for all such infra-specific epithets added to the biverbal specific name (a binary) would convey nothing more than the binomial as typified strictly by the type specimen (species sensu stricto). Further, a varietal name (which is ternary), when applied to the type of a species (a binary group), involves a contradiction in terms. I submit this systemic incompatibility as the principal reason why a formal trinomial given to the type of a species (species sensu stricto) cannot have a status under the Rules and so cannot be used in priority considerations. BOLLE (Notizbl. Bot. Gart. Berlin-Dahlem XIII, 1937 pp. 524–530 with an appendix by Harms, Mattfeld and Pilger) has

shown that serious complications arise by considering valid the infra-specific epithets conventionally adopted to indicate the species sensu stricto, their invalidity being also explained independently by me in Gard. Bull. Straits Settl. IX, 1937, pp. 242–244 (cf. also XI, 1939, pp. 19–20).

Nevertheless FOSBERG (Amer. Journ. Bot. XXVI, 1939, pp. 229–231) and CROIZAT (Journ. Arnold Arb. XXII, 1941, pp. 133–142) have scanned the misleading rule of "superfluous" names (cf. Discussion 15 below) and have come to the conclusion that "there is nothing in the rules which says that ordinary sub-divisional epithets shall not designate the typical sub-division." (Fosberg). In fact CROIZAT has created nomenclatural complications by applying the rule of priority to the varietal epithets given to the species var. *typica*. A name that contravenes a very fundamental principle in the nomenclatural system should be regarded as invalid (having no status under the Rules). There is no sense in scanning the provisions of legitimacy or priorability to find whether there is in them anything to prevent the use of such a name, as they are applied only to those names that are valid (have a status under the Rules).

Difficulties in understanding this principle arise when a botanist considers a species as a wide group to be subdivided into smaller groups (varieties). Horticulturists, by ignoring the type-concept, follow this system and make varieties their lowest autonomous units, the aim in horticulture being to name and describe the lowest variation. But, unlike horticulturists, the taxonomist not only accepts the type-concept but also makes the species the lowest autonomous unit, admitting varieties and subvarieties as subordinate groups only. The type-concept implies that the species sensu stricto (var. *typica*) be taken as the "standard" with which to compare the divergent elements. If the differences do not deserve a separate specific rank, then the elements are classified with the "standard", the differences being considered as minor. Should some of the minor differences be considered as meriting special attention, then the principal differing elements are named and characterized as deviations (varieties) from the type (species sensu stricto), while those differing from the type of the variety are named as subvarieties. The type form of the species itself does not receive any infra-binary name except a conventional epithet when one wishes to emphasise that the binary group should be interpreted strictly according to the type. In this connection it might not be out of place

to quote here the very apt remarks made on the subject by Prof. L. H. Bailey:

> As employed by the writer, following Article 30, Recommendation 18, of the International Rules of Botanical Nomenclature, the epithet var. *typica* is not regarded as a new name, but as a parenthetical practical device to permit accurate designation of the typical element of a species. It has no nomenclatural standing and does not require the citation of an authority. Whenever a variety or a subspecies is described or placed in a species, the typical element of that species automatically becomes variety or subspecies *typica*. (Gent. Herb. IV, 1940, p. 292).

Here BAILEY is not considering the distinctions shown to exist between sub-divisionary and disjunctive groups (Discussions 5–8 below), a distinction which makes a variety always a ternary group even when there be a subspecific epithet preceding the varietal epithet; but the principle of var. *typica* is clearly indicated. It is also important to note here that the Rules as drafted at present admit varying interpretations so as to lead BAILEY to maintain a view quite opposed to that of FOSBERG and CROIZAT.

5. Sub-divisionary and Disjunctive Groups

False analogies seem to have played a good deal of influence in the modifications that have extended the application of special rules covering the names and descriptions of subspecies and of sub-divisions of genera, to the names and descriptions of other subordinate groups also. Thus, if epithets denoting a subspecies could be omitted in a "quadrinomial" so as to make the varietal name always a ternary trinomial, the analogy has been erroneously extended to the epithets denoting inferior groups so as to make it "permissible to reduce more complicated names to ternary combinations." (Art. 28). Because the description of a subspecies (or a section) can be referred to in validating a specific (or a generic) name, the descriptions of varieties, subvarieties, formae and subformae have been invested with the power to validate any group from a species downwards (Arts. 49 and 58). Since epithets denoting a subspecies have a priority right outside their own species, the same sort of right has been extended to epithets denoting generic sub-divisions outside their own genera (Arts. 53 and 56) and similarly to epithets denoting varieties and other inferior groups outside their own species (Arts. 55 and 56). Before assessing the need for making different sets of rules to cover these different groups, it would be advisable to pause a while to examine how

groups like a subgenus or section differ philosophically from groups like varieties and subvarieties, leaving the subspecies for a special discussion by itself.

Groups like subgenera, sections and sub-sections divide a superior group into *two* or more sub-divisions. There can never be only one sub-divisionary group under its immediately superior group; the existence of one such sub-division, therefore, implies the existence of at least another of the same rank and in the same position. Hence should there be only two sub-divisions under a group, the suppression or transference of one means also the death of the other. Only these kinds of groups are called here as *sub-divisionary*.

In this sense varieties and subvarieties are not sub-divisionary groups; they are subordinate groups of the *disjunctive* class, being minor *deviations* from the "standard" set by the type specimen (Discussion 4). It is possible to have only one such disjunctive deviation under a species or a variety. Sub-divisionary groups are established to classify previously well recognized entities of a different category, and so each sub-divisionary group must at least include one such entity in it; whereas a disjunctive group is created to show a newly recognized deviation from the standard and so is not a heading for grouping any other subordinate entities (see Discussion 12 below, where the species and genera are shown to belong to neither of these two categories).

In view of these differences there are no compelling reasons for subjecting the names of both these kinds of groups (sub-divisionary and disjunctive) to a uniform set of priority and other rules; on the contrary it is proposed to show below reasons for subjecting each kind to a different set of rules.

6. Priority of the Names of Generic Sub-divisions

Taxonomically, the sub-divisionary entities under a genus appear to be unstable and represent different attempts to classify the species with the view either to indicate their affinities or geographical distribution, or to facilitate their identification. Hence these infra-generic sub-divisionary groups vary in importance according to the basis and aims for which the sub-divisions are made. The orthodox practice is to allow priority to the names of infra-generic sub-divisionary groups only when the basis of the classification is the same; not otherwise, and never outside their own genus. Of course in the examples mentioned in Art. 53, the sectional name is retained outside its original genus; but

there are also numerous instances where such names are rejected because their retention, on the transfer or remodelling of the divisions, would cause serious complications both in nomenclature and in taxonomy. Thus GRIFFITH (1844 and 1850) divided *Calamus* into three sections:

Section 1: PIPTOSPATHAE Griff.: Only the lowermost spathe is persistent; others deciduous.

Section 2: PLATYSPATHAE Griff.: All the spathes persistent, tubular only (if at all) at base, expanded into a broad, loose lobe at the end.

Section 3: COLEOSPATHAE Griff.: All the spathes persistent, strictly tubular throughout, obliquely truncate at the end.

Subsequent botanists retained these sections only when the basis of their classification remained the same as GRIFFITH's. Thus, RIDLEY (Mat. Fl. Malayan Pen. II, 1907 p. 189–190) in dividing *Calamus* into sections on a different basis, was right in not retaining any of GRIFFITH's sectional names. RIDLEY divided his sections as follows:

Section 1: MISCHANTHECTAE Ridl.: Spadices flagellate, leaves not flagellate.

Section 2: PHYLLANTHECTAE Ridl.: Leaves flagellate, spadices not flagellate.

It is obvious that this aspect of the question has been overlooked in the Rules, and on false analogy the provisions applicable to the names of genera and species have been applied to the names of the sub-divisionary class also. No doubt we must avoid useless creation of names, whatever that phrase may mean (Art. 4); but any attempts to effect definiteness in the nomenclature of sub-divisionary groups where no such definiteness is obtainable in taxonomy, are likely to raise more difficulties than solve them. It is better to have more names and clear taxonomy than fewer names and confused taxonomy.

In the appended proposals therefore the rule in Art. 53 has been transformed into a recommendation to be applied whenever possible, and at the discretion of the botanist effecting the transfer of, or sub-dividing, the group.

7. Subspecies are Sub-divisionary Groups

As to the status of the subspecies, there are two widely divergent views current at present: the one regards the subspecies as a taxonomic group larger than, though of the same class as, a variety; the other considers the subspecies

as a sub-divisionary group, that is, a taxonomic device of the same nature, not of the same rank or position, as a section of a genus. In the latter sense a subspecies helps to classify the varieties occurring in very large, widely polymorphic groups called metrospecies, super-species, species complex, or species sensu amplissimo. In a stricter sense the subspecies could have been raised to a specific rank, but the intergrading variations do not allow a clear cut distinction; such groups are generally found in plants which have been cultivated extensively for a long time under different ecological or other conditions. This latter concept, which makes the subspecies a sub-divisionary group, is the older of the two and is one that seems to be widely current; it is also one that accords fully with many current nomenclatural procedures and, therefore, deserves to be adopted in the Rules.

Further, all the subspecific groups were at one time considered as good microspecies sensu stricto, and so subspecific names were admitted also as alternative specific names, the latter being formed by dropping out the specific epithet from the subspecific trinomial. It is because of this view that all subspecific names are registered as specific names in the early parts of *Index Kewensis*, and the practice has been long current to accept as valid all subspecific names even when published as binomials under a species. But in the Rules the status of subspecies has been confused with the disjunctive groups, as if a subspecies were merely a large variety. As a result of this confusion there has arisen a tendency to disregard subspecific names as good alternative specific names. Those alternative specific names that are current for subspecies have been taken as validly published in the nomenclators where they were first registered as binomials; it is overlooked that the compilers of nomenclators like Index Kewensis did not intend to create new specific names for subspecies, but recorded what sound practice then current obliged them to record. It is necessary to remove this confusion from the Rules. It seems desirable to legislate invalidating automatic alternative specific names to subspecies published after 1930.

8. Specific Names and Infra-Specific Descriptions

Since subspecies are microspecies based on characters co-ordinative with the species, it follows that reference to a subspecific description is sufficient to validate a species—a conclusion also defensible on the basis of a subspecies being a sub-division of a species (cf. generic names validated by

referring to the descriptions of subgenera, sections and subsections which might be called microgenera). But on false analogy specific names have been allowed to be validated by referring to the descriptions based on subordinate characters of the disjunctive groups (Arts. 49 and 58). This practice (now legalised) forms at present the only reason for discouraging taxonomy of cultivated plants (see also Discussions 4 and 13). Under Arts. 49 and 58, infra-specific names, when abbreviated by non-taxonomists into biverbals, might have to be accepted as good specific names, though published in most unexpected places like nurserymen's seed-lists, lumbermen's journals, agricultural field experiment records, and catalogues of plant-products. Not only would such names burden systematists with useless, confusing synonymy, but would often necessitate name-changes because of their priority or homonymy. Another result of the provisions in Arts. 49 and 58 is to admit the use of binary names to infra-specific groups prohibited under Art. 28, for these horticultural binomials would be nothing more than binary names created by incompetent persons for the taxonomist's varieties, subvarieties, formae and subformae. (For further complications that this procedure would cause if the theory of implicit references were admitted as valid, see Discussion 25).

In view of this it seems necessary to change the terminology in Arts. 28, 30, 44, 49, 52, 55, 56 and 58, and to alter Arts. 49 and 58 so as to prohibit validation of specific names by reference to the descriptions of disjunctive and other subordinate groups.

9. Priority of Ternary and Sub-Ternary Names

On the mistaken belief that subspecies are merely subordinate groups analogous to varieties and subvarieties, the rule of priority has been uniformly applied to the epithets of all these groups. The epithets of varieties and subvarieties, like those of subspecies, have been thus invested with priority claims even outside their species and genus (cf. Arts. 55 and 56). One has only to try to straighten the nomenclature of the varieties of, say the Date, Wheat, Rye, Soya, Rose, Mustards, and Oranges, to realise the utter hopelessness of working out the nomenclature on these provisions. Added to this there is the difficulty of typifying the names of varieties, subvarieties and other subordinate groups, because these are based often on characters not identifiable in herbarium specimens, and also because often plant-geographical procedures are not applicable in typifying such names. The only practical solution

in such cases lies in limiting the priority of these names under their immediately superior groups and not to permit reduction of infra-ternary combinations except by removing the intercalating omissible epithets (subspecific epithets and var. typica). An amendment has therefore been proposed so that varietal epithets instated under one species may not have a priority claim outside that species.

10. The Status of Formæ and Subformæ

Formae and subformae fall outside the scope of alpha and omega taxonomy, though in economic botany these groups may be given a status similar to varieties. Their study leads one into the realms of physiology, horticulture, and genetics. It is evident that these groups have been admitted as special subjects of nomenclatural rules. Their nomenclature therefore should not be allowed to interfere with that of disjunctive taxonomic groups subordinate to a species. Reference to their descriptions should not be allowed to validate the names of any higher groups like varieties and species, nor of any groups outside their immediate superior group.

Further, formae and subformae may be distinguished even in the species, variety and subvariety (all sensu typico). Reducing them to ternary expressions when instated as infra-ternary groups will therefore confuse their identity; hence such reductions should not be permitted even when the intercalary epithet is that of a subspecies, unless the epithet is var. *typica* or its equivalent.

11. Reducibility of Infra-Ternary Names

It has already been shown that subspecies are subdivisions of a species complex and that the subspecific epithet may be omitted. Also the varietal epithets instated under subspecies may be joined directly to the binomial denoting the species sensu amplissimo. It has been shown further that this procedure cannot be extended to the epithets of non-subdivisionary groups (the epithet *typica* or its equivalent is a conventional device having no priority claim). Because of this permission to omit sub-divisionary epithets, *Erysimum hieraciifolium* subsp. *strictum* var. *longisiliquum* and *E. hieraciifolium* subsp. *pannonicum* var. *longisiliquum* (example given under Art. 30) form a pair of homonyms (*E. hieraciifolium* var. *longisiliquum*), one of which has to be rejected under Art. 61. Further as var. *typica* should have no status under the Rules, the name *Saxifraga Aizoon* var. *typica* forma *rubra* can be abbreviated into *S. Aizoon* forma *rubra*. But because such

"quadrinomials" can be abbreviated to trinomials, analogy cannot be extended to permit reduction of infra-varietal names to ternary combinations without causing serious confusions in nomenclature. The rule which permits the reduction of infra-ternary combinations should therefore be modified.

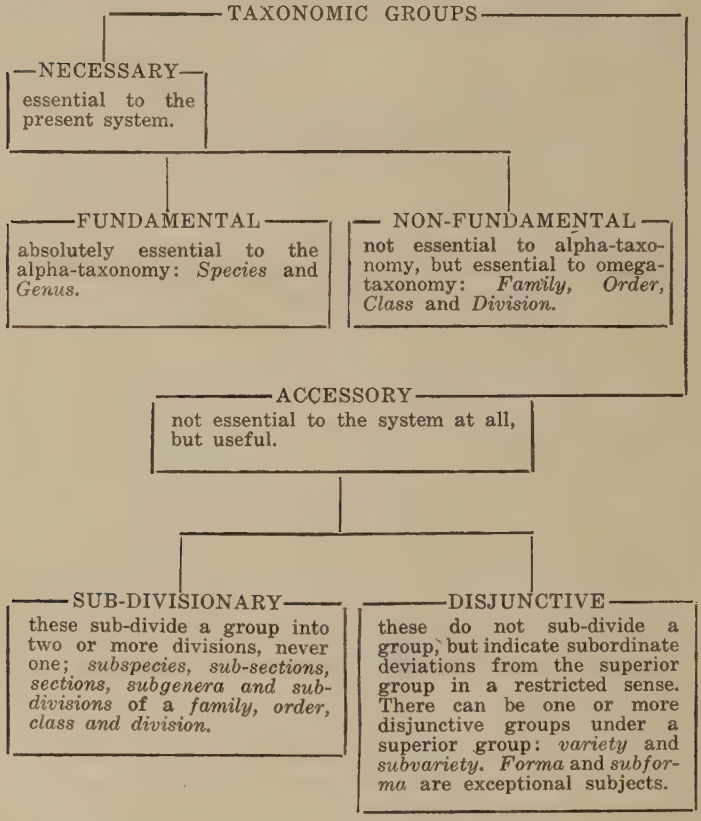
12. Philosophical Differences in Taxonomic Groups

In the foregoing Discussions, I have attempted to show that, in addition to differences in categories or ranks of taxonomic groups enumerated in Arts. 10–12 (which may be said to be phylogenetical), there is also a philosophical difference in these groups according to their nature, and their relationship to their immediately superior or inferior group. In order to bring out these differences, the taxonomic groups are here divided into *Necessary* and *Accessory* groups.

The *Necessary* groups are essential to the present system of nomenclature and taxonomy, and the existence of one implies the existence of all the others, both superior and inferior to the one mentioned; there need not be more than one Necessary group under a superior group. The Necessary groups are Species, Genus, Family, Order, Class and Division. Among these, the Species and the Genus are the only two which are absolutely essential to the binomial system of nomenclature, and so to the immediate aim of taxonomy (alpha taxonomy, as some botanists would call it), that is, to the naming of the distinguishable species in the vegetable kingdom; hence these are called the *Fundamental Necessary* groups. The remaining Necessary groups are not essential to alpha taxonomy and were introduced into the system much later than the *Fundamental Necessary* groups; but these *Non-Fundamental Necessary* groups are needed in order to achieve the more remote aim of taxonomy (omega taxonomy), namely, to understand the phylogeny of different species of plants, or their taxonomic affinities.

The *Accessory* groups, on the other hand, are useful to indicate the affinities of the inferior groups under a superior one; they are divided into two categories, the *Sub-divisionary* and the *Disjunctive*. The *Sub-divisionary* groups divide a group into *two* or more inferior ones, and so can never exist singly under an immediate superior group; subspecies and sub-divisions of a Genus, Family, Order, Class and Division fall into this category. The *Disjunctive* groups represent subordinate deviations (not co-ordinate) from an accepted unit or standard: they are varieties and subvarieties. *Formae* and *Subformae*, being of varying nature, and at present not well defined, are included as

special subjects of nomenclature. Their taxonomy lies outside the scope of alpha taxonomy, being a corridor into the realms of physiology, horticulture and genetics.


TAXONOMIC GROUPS
NECESSARY
essential to the present system.
FUNDAMENTAL
absolutely essential to the alpha-taxonomy: *Species* and *Genus*.
NON-FUNDAMENTAL
not essential to alpha-taxonomy, but essential to omega-taxonomy: *Family*, *Order*, *Class* and *Division*.
ACCESSORY
not essential to the system at all, but useful.
SUB-DIVISIONARY
these sub-divide a group into two or more divisions, never one; *subspecies*, *sub-sections*, *sections*, *subgenera* and *sub-divisions* of a *family*, *order*, *class* and *division*.
DISJUNCTIVE
these do not sub-divide a group, but indicate subordinate deviations from the superior group in a restricted sense. There can be one or more disjunctive groups under a superior group: *variety* and *subvariety*. *Forma* and *subforma* are exceptional subjects.

13. The Nomenclature of Hybrids and Cultivated Plants

From Arts. 10, 12, 28 and 35, it appears that the taxonomist generally regards the study of hybrids and of cultivated plants with suspicion; in fact it would seem from the wording of the Rules that these plants are precluded from being named botanically. However, an examination of the names of cereals, fruits, vegetables, ornamental and oil plants reveals the fact that plants derived from hybridisation, or known only in cultivation, were formerly considered as worthy subjects of botanical nomenclature;

their names, even if given after the 1930–35 Rules, are retained as valid. The wording of the above cited Articles seems therefore to have no value except to show that, in general, the taxonomy of non-feral plants is to be discouraged.

The first reason for this attitude is that such plants are usually studied, described, and even named in their own way, by agronomists, horticulturists, or nurserymen, who are often unfamiliar with botanical nomenclatural procedure. In many such cases, biverbal or binomial names in Latin are used. When descriptions in any romanised European language were admitted for instating a valid botanical name, there was a real danger of the botanical nomenclature of cultivated plants being burdened with a host of binomials based on biological, physiological, anatomical, horticultural and genetic distinctions. But now this danger has been removed by prescribing Latin for describing taxonomic groups of recent plants (except bacteria) after 1934.

The second reason for discouraging the taxonomy of cultivated plants is because of the procedure, now becoming popular, of instating specific binomials by referring to descriptions of varieties and infra-varietal groups. Under such a procedure all the abbreviations made of varietal and infra-varietal names by non-systematical workers would have to be accepted as valid specific names. If such a validation of specific names were prevented, there would be no justification for refusing to admit the plants of cultural and hybrid origin as normal subjects of nomenclature. (See Discussions 8 and 10).

14. The Status of the Rules Regarding Hybrids

To many taxonomists Arts. 31–34 are a frequent source of confusion. If, for instance, at the time of giving a name to a species or a genus, its supposed hybrid origin is indicated and the putative parents mentioned, some taxonomists maintain that such a name would be a good nomenclatural entity, but not subject to the ordinary rules of nomenclature. Under this view the name would have to be associated not with the taxonomic group described, but with the putative parents. Should a subsequent botanist disagree with the alleged parentage and indicate different parents, then the nomenclaturists would change the name. This view would also permit validation of names in anticipation of actual production of hybrids (cf. *Colmanara* and *Hatcherara* in Orch. Rev. 1948, p. 145). The supporters of this view overlook the fact that the name is to be associated with the taxonomic

group represented by the type specimen and with its description, and not with the alleged or real ancestors (Arts. 15 and 18). Further a formula denoting a hybrid will include all the different phenotypes and genotypes produced in the successive filial generations and may consequently include also genotypes resembling one or both the parents. Therefore such formulas, although helpful to the geneticist as recording the history of his hybrids, will not help the taxonomist to identify the plants themselves. The formula is therefore not a substitute for a diagnosis. Moreover correct formulae are sometimes unusable for systematic purposes in the case where one of the putative parents has to be given the status of a variety, as is often the case when its putative hybrid offspring have already been given the rank of a species. Thus if C is a genotype derived from a cross between A and B, and differs only varietally from B, and if A and C have been named specifically earlier than B, then B can only be named nomenclaturally as a variety of C, even though the latter is genetically derivative from B. The formula A x B = C cannot be accepted by systematists, when nomenclaturally B is a variety of C.

It is evident therefore that the object of Arts. 31–35 is to put some sort of order in non-botanical nomenclature of cultivated plants and hybrids, so that it may serve the purpose of communicating to the public the results obtained in applied botany in general. It was never intended to give non-technical names a status in botanical nomenclature. The plea that the earlier use of the formula *Juncus alpinus* x *articulatus* is an obstacle to the use of *Juncus alpino-articulatus* is therefore based on a misconception (cf. Dr. A. Becherer's proposal for the 1935 Congress).

In view of this susceptibility of the rules to be misinterpreted because of their misplacements, Arts. 31–35 have been proposed to be transferred to their proper places in Appendix VII of the Rules. A recommendation might be inserted in the code advising botanists to follow horticultural rules for cultivated plants that cannot be placed in any definite taxonomic categories. If these Articles are transferred to Appendix VII, then Art. 14 is not required; besides it is questionable whether the definitions of half-breeds (*mistus*) and hybrids (*hybridus*) will be uniformly accepted by taxonomists, horticulturists and geneticists; for the application of these terms is made dependent on taxonomic opinion regarding the status of the putative parents of the hybrids, e.g. *Vinca rosea* x *V. alba* (*hybridus*) = *V. rosea* x *V. rosea* var. *alba* (*mistus*). (cf. also Furtado in Gard. Bull. Straits Settl. XI (1939) 10–13 and in Fedde, Repertorium XLIV (1938) 244–255).

15. The Rule of Superfluous Names

Sound jurisprudence demands clear distinctions in the rules of validity, priorability and legitimacy. The rule of validity should tell when a name should be admitted as a valid nomenclatural entity, all names having no claim to recognition by botanists being invalid (Art. 19A). The rule of priorability should direct when a given valid name should be included in priority considerations; while the rule of legitimacy should decide whether a certain priorable name is legitimate or illegitimate in the given circumstances. But instead of distinctions, all the offences against these three categories of the rules have been lumped together in Art 60 as if they all mattered directly to the priority rule, thus overlooking the important fact that only the names that are valid and priorable can be included in priority considerations. A further complication arises because in certain cases the procedure has been inverted in Art. 60, so that the rule of priorability is made dependent on the correct application of the rule of priority. Thus the name becomes impriorable merely because it has been instated against the priority rule.

Furthermore in a code where the rules are made to be followed, there is no need to enumerate separately all the offences that may be committed under the provisions already in the code. Such an additional enumeration increases unnecessarily the bulk of the code, and may bring about ambiguity in some of these offences, especially when, as in Art. 60, they are all lumped indiscriminately together. However, it is of great importance to classify the offences according to their four categories referring to validity, priorability, legitimacy and propriety of names (the last mentioned category being concerned with the correct gender, spelling, manner of citation, and authorship). It is desirable to delete Art. 60 altogether, and to provide for the classification of these four categories of offences (cf. Furtado in Gard. Bull. Straits Settl. XI, 1939, pp. 1–4 and Arts. 2B, 19A & B, 53A and 59–69).

However, in most cases, names published in violation of the priority rule cannot be employed as legitimate, not because of the existence of Art. 60, but because the priority rule (Art. 56) prescribes the use of the oldest priorable name or epithet that can be adopted in the required position. Thus, in the example discussed under Art. 60 (1) *Cainito* Adans. (1763) has to be disregarded because *Chrysophyllum* L. (1753) is the oldest usable name in the given circumstances. There are also cases where a new name is not synonymous with the names cited under it. The citation means either that the cited synonym is taken in a particular

misinterpreted sense, or that the new name is taken in a very wide sense. In the latter case, the included synonym is considered taxonomically or ecologically a minor or less primitive group to be separated co-ordinately, whenever the sense of both is severely restricted. Rejection of such new names would cause more problems than it would solve, and may necessitate a lengthy nomina specifica conservanda. The best solution in all these cases is to ignore Art. 60 altogether and to treat the names under the rule of typification (*see* next Discussion). This principle would find a strong justification in the procedure followed prior to the 1935 Rules by almost all supporters of the type and priority concepts. Its abandonment now appears to have been voted without foreseeing the evil consequences that would result therefrom. In the accompanying amendments therefore directions for definite typification of such names have been given, Art. 60 has been eliminated and provision for the classification of offences according to their different categories has been included.

16. Superfluous Names Under the Rule of Typification.

In order to follow the principle elaborated above, it would be useful to examine here some examples:

Example 1: E. GEDNER (*Ficus*, 1786, pp. 5, 11 & 15), in a dissertation prepared under the direction of THUNBERG, quoted "*Ficus pumila* Linn. Syst. Veg. p. 922" in the synonymy of a new species, *F. erecta* Gedner. On the face of this circumscription, *F. erecta* appears to be a "superfluous" name (Art. 60–1). But from the original specific description as well as from the fact that GEDNER has retained *F. pumila* (bearing the same reference) as a good species, it is obvious that some such word as *partim* was understood after the synonym. This case is clear because GEDNER has treated both *F. pumila* and *F. erecta* in the same pamphlet; had he restricted himself to describing only the new species, Art. 60–1 would have been applied without any further inquiry. Rather than reject *F. erecta* as a "superfluous" name and thereby create complications, the species should be typified on the holotype or lectotype of the new description.

Example 2: *Cerastostylis eriaerioides* Hook. f., Ic. Pl. (1891) 2074 was a "superfluous" name because it was based on *Eria pygmaea* Hk. f., Fl. Brit. Ind. V (1890) 804, a priorable name having an epithet that could have been adopted in the new position. But since *C. pygmaea* (Hook. f.) comb. nov. cannot now be used because of *C. pygmaea* Evard. *ex* Gagn. in Bull. Soc. Bot. France

LXXIX (1932) 33, *C. eriaerioides* Hk. f. must be employed as the correct (legitimate) name. To reject this last name as "illegitimate" with Hook. f. as its author and then to adopt it again under a different authorship and different date as a non-homonymous name is not a satisfactory procedure (*see* Discussion on Later Homonyms 22).

Example 3: *Wendtia* DC. (1830) was published as a better spelling for *Wendia* Hoffm. (1814). *Wendtia* DC. must not be rejected as having no claim to recognition, on the plea that it was "superfluous" nor *Wendtia* Meyen (1834) be allowed as a non-homonymous legitimate name (cf. Furtado in Gard. Bull. Straits Settl. IX, 1937, p. 252). These names must be typified on their respective types. *Wendtia* Meyen (1834) cannot be accepted because it is a later homonym of *Wendtia* DC. (1830) (*see* Discussions 28 and 29).

17. The Nomenclatural Types

The first part of the Note under Art. 18 states that "the nomenclatural type is not necessarily the most typical or representative element of a group". Since the word *typical* has no relation whatsoever to the word *type* occurring in the same sentence, and since the word *representative* is nowhere defined in the Rules, the above quoted sentence appears to express a contradiction in terms; and CROIZAT, even after distinguishing between what he called *physical* and *nomenclatural* types, found the statement in the note incomprehensible (Journ. Arnold Arb. XXII, 1941, pp. 133–142). In order to make the meaning clear therefore the following revision of the Note is suggested:

> **The nomenclatural type does not necessarily represent the element of a group that is genetically the most simple, phylogenetically the most ancient, ecologically the most common, taxonomically the most polymorphous, or biologically the most perfect.**

Further, for the purposes of nomenclatural rules, the lowest category to which taxonomists can go is not the individual plant as implied in Arts. 10 and 12, but the *type specimen* as implied in Art. 18. Specimens from the same individual may show different phases of growth. Names given to monstrous specimens may not be priorable (Art. 65); and in certain fungi only specimens from the perfect stage of the individual must be considered as valid types, so that earlier names based on invalid types cannot replace those based on valid ones (Art. 57). It must be further admitted that genera as a rule are based on specimens and in some cases these specimens are not the nomenclatural types of any of the included species. This is particularly

true of the new monotypic genus where the "type species" has to be designated with the epithet of an older species. The statement therefore that the type of a genus is always a species has misled botanists to give contradictory decisions. This statement applies well to the genera in Linn., Sp. Pl. eds. 1 and 2, where each genus has been instated merely by mentioning the species included under it, a procedure contrary to Art. 41, but allowed as a special case under Art. 42 (second paragraph). But in all other cases, the genus has to be associated with its holotype or lectotype specimen. Only when the specimen type of the genus and that of its species are identical, may the type of the genus be indicated by merely mentioning the species. In the accompanying amendment (Art. 51A Note 3) provisions are therefore made for observing this principle.

If these principles were adopted, the amendments proposed by CROIZAT regarding the type in Arts. 18, 30, 51, 52, 61 and Rec. XVIII and XXXV are not needed; and without the acceptance of these principles, the amendments suggested by CROIZAT are not workable in many cases. However, in Rec. VII the word "type" should be replaced by the word "syntype" (*see* Furtado, Nomenclature of Types in Gard. Bull. Straits Settl. IX, 1937, pp. 285–309). It is also necessary to delete from the third line in the example of Art. 18 the words "and description" and to substitute "subdividing" for "revising" in Rec. V (*see* also Discussion 19–21). Further since "var. typica" does not indicate a separate ternary group other than the species itself, it would be misleading to say that a species has been established on one of its varieties. As shown in Discussion 4 the simultaneous publication of priorable names for a variety and its species both based on one and the same specimen is a systemic incompatibility under the binary binomial system of names (*see* also Discussion 18).

18. References to Misapplications

It is stated in Art. 18 that "the name of a group must be changed if the type of that name is excluded (*see* Art. 66)". Now Art. 66 is to be applied in particular circumstances; its application cannot therefore be generalized in Art. 18 so as to make it applicable in all circumstances. Art. 66 has nothing to do with the nomenclatural type which has been defined as "that element of a group to which the name of the group is permanently attached". (Art. 18); Art. 66 forbids the use of a name for a higher group if that name has been derived from the name of a genus which is not retained in the group.

An erroneous use of the word "type" to mean "the root-name" in the sentence of Art. 18 where the "type" otherwise means "nomenclatural type" has misled many to the conclusion that a new name connoting a new taxonomic group can be validated by referring to a residual description after its type has been excluded from it. But this conclusion overlooks the fact that a taxonomic group ceases to exist when its type is excluded from it (cf. Furtado in Gard. Bull. Straits Settl. IX, 1937, pp. 258–267). The 1935 Congress, by deciding that *Tsuga Mertensiana* Carr. and *T. Mertensiana* Sarg. *non* Carr., were not two homonyms, but one and the same name, *T. Mertensiana* (Bong.) Carr. *emend.* Sarg., with *Pinus Mertensiana* Bong. as the basinym (Art. 54), showed that a misinterpretation does not create a new taxonomic group, nor a new type.

A misinterpretation based on new specimens implicitly includes also the type of the misapplied name. Besides, such a description does not indicate how much of it is based on the old type, and how much on new misidentified specimens. Often the new description is the old description slightly altered in order to cover new data based on re-examination of the old specimens and additional data of what is regarded as a subordinate variation of the same group though noticed only in the new specimens. This new description cannot be dissociated from the old type included implicitly in the new description. Thus *Gonolobus rostratus* (Vahl) R. Br. (1809) *sensu* Schlechter (1899) is not able to validate *G. jamaicensis* Rendle *nom. nov.* in Journ. Bot. LXXIV (1936) 245; for RENDLE, by excluding the type from the description of SCHLECHTER, intended to create a new taxonomic entity. RENDLE should have therefore given a new description and in Latin. If, on the other hand, *G. rostratus* as described by SCHLECHTER were admitted to mean that it is SCHLECHTER's description *minus* the type of *G. rostratus* (Vahl) R. Br., then contrary to the provisions in Arts. 47 and 54, every misinterpretation of a name would create a new homonym, and so *G. rostratus* R. Br. *sensu* Schlechter would be equivalent to *G. rostratus* Schlechter, though SCHLECHTER himself had admitted VAHL's type as the type of the group he re-described.

The only safe guide for the botanist who wishes to make a new taxonomic group out of a misapplication is to re-describe it at the time of publishing its new name. In view of this I propose the deletion of the misleading clause from Art. 18, and have added a special note in Art. 37 so as to deny explicitly any valid status to misapplied descriptions and names.

19. Typification of Names in Starting-Point Works

In a previous paper I attempted to show that the names published even without any description but in books adopted as nomenclatural starting points cannot be rejected as invalid (cf. Blumea, Suppl. I, 1937, pp. 123–132). In a subsequent paper I pointed out that often LINNAEUS, in adopting pre–1753 names, did not retain the original sense, and that it is to oblige botanists to typify the names on their 1753–types, and not on their previous ones, that the 1905 legislation fixed 1753 as the earliest starting-point for the species and genera, and invalidated earlier references under the same name (Furtado in Gard. Bull. Straits Settl. X, 1938, pp. 162–172 and Art. 42 (2) and Art. 44 (2) of 1935 Rules). According to these principles, therefore, the name adopted in any starting-point book should be typified on the description given (if any) and the types cited or implied in the book itself, even when the name and its description in this book is taken bodily from an earlier book having different types (cf. also Art. 54 in 1867 Code and De Candolle's Commentary on it).

This procedure is fundamentally opposed to that adopted by KUNTZE (Revisio Genera P1. 1891–98 and with POST, Lexicon 1904), who typified the names on their history prior to their validation under the Rules. KUNTZE's plea was that nobody should have any right to change the application of a name after its publication, even if this publication were before the starting-point, and, therefore, invalid. But decisions made by the 1905 Congress obviously condemn KUNTZE's procedures of typification, and permit the names to be typified on any syntype used in the starting-point books (Furtado in Gard. Bull. Straits Settl. X, 1938, pp. 173–181). Much of the confusion that exists among mycologists on the interpretation of the Friesian species and genera could be eliminated by following this general principle. The botanist who detects any *mixtum compositum* should have the right to choose any of the specimens as the lectotype on botanical grounds (Furtado in Gard. Bull. Straits Settl. IX, 1937, pp. 244–249 and XI, 1939, p. 18 Art. 22B).

20. Typification of Names on the Author's Manuscript Notes.

No typification of names should be made solely on clues left by the authors on herbarium sheets. Such notes or signs are often of a provisional nature, and if they were of paramount importance in typification, they should have been published. A botanist may often name a specimen in a herbarium because it looks aberrant; he may even indicate it as the type of the name and make numerous notes on the sheet. Yet he will often delay the publication of the group

until he has had better specimens for study. In such cases the information found on the herbarium sheet first seen by the author may be misleading. Besides, not all the sheets subsequently studied by the author may be in the same herbarium, and where isotype duplicates are available, subsequent botanists need not apply for the original material, especially in cases where such material is not easily loaned nor allowed to be photographed. There are also cases where the original notes have been placed in the herbarium on wrong sheets during the course of mounting or remounting the same. In view of this, unpublished herbarium data should be used with the greatest caution, and must not be allowed to form the sole or even the principal basis for rejecting a typification made on published information. Much confusion has often been created by overlooking this principle (cf. Furtado in op. cit. X, 1939, pp. 330–335). However if no lectotype has been selected, such data might provide excellent clues for the valid typification of the taxonomic group. It is essential also that the lectotype should not be lightly chosen, and without any necessity (Furtado in op. cit. IX, 1937, pp. 296–299). That by a wrong selection of a type the whole series of subsequent studies may be misdirected is evident from the case of *Rhus filicina* DC. (1825) typified in Art. 51 Note 1 and Note 3 (examples in the accompanying proposals) (*see* also Discussion 21 below).

21. Typification of Names with a Meaning

From time to time one comes across botanical names whose special meaning contributes to make them treacherous typification-quizzes. The elements which botanists have to consider in such cases are two, namely: (*1*) the root of the name itself which refers to the collector, locality, ecologic conditions, vernacular name, economic uses, or to some such data found on the label or sheet of one specimen; and (*2*) the validating description based primarily on another specimen. Which out of the two specimens should be chosen as the lectotype?

From the type concept as elaborated in Art. 15, 18 and 59, it is obvious that the nomenclatural entity must be typified on the specimen on which the validating description was based; the particulars derived from wrongly assigned specimens must therefore be ignored (*see* previous Discussion 20).

Should it be decided that a name must be typified on the type that formed the source of the name and not on the one that formed the chief basis of the description, then such a ruling would be tantamount to giving a permission to

establishing a taxonomic group merely by indicating the specimen and its collector, locality, ecology or vernacular name. It must not be overlooked that often names are taken from imperfect specimens, useless for any precise identification, whereas the descriptions are drawn from better material. Several authors have founded the names of genera and species of orchids on clues found on imperfect syntypes in the herbarium, but have based the validating descriptions on perfect living material. It is obvious that, in such cases, what validated the name is the description based on the type studied. To ignore this and to disregard the type of the validating description in order to follow a line of the least resistance in typification is to torpedo the type basis concept altogether. The principle of typifying a taxonomic group having two "types" of the afore-mentioned categories is in no way analogous to the principle adopted in typifying a new combination whose instatement has been accompanied both by a new description and the citation of the validating basinym. Here the epithet is attached to the type of the description of the basinym and so the author of a new combination is not free to apply it to another type and description. On the other hand, a name created for a new taxonomic group has to be interpreted on the types of the principal part of the description. This interpretation of the taxonomic group has nothing to do with the derivation of the name; for, the purpose of giving a name is not to indicate the characters or the history of the group but to supply a means of referring to it (Art. 15). This contention might seem contrary to the Rec. XV (*f*) in the Rules; but the fact that a principle has been embodied in a recommendation is a clear proof that it is not obligatory. The purpose of Rec. XV (*f*) is to discourage names being made from such root-words as might mislead inexperienced inquirers to erroneous conclusions. It is not meant to be applied in typifying names already made.

Thus, in the case of *Carex Oederi* Retz., NELMES (Journ. Bot. LXXVII, 1939, p. 301) has shown that RETZIUS based his specific description not on Oeder's figure (a syntype cited), but on a specimen identical with *C. pilulifera* L. Later RETZIUS himself recognized the correct identity of the species and made a reduction accordingly. If RETZIUS's specimen were a new species and not identical with *C. pilulifera*, then *C. Oederi* would have been used as the legitimate name for the species. To say that, in such an event "it would have then been logical, not to call the new species *C. Oederi*, but to give a new name, such as *Retzii*" (Airy-Shaw in Kew Bull. 1947, pp. 35–37) is not a logical procedure. To be logical the first botanist to

recognized the *mixtum compositum* should have the liberty to typify the species on any one of the two syntypes on botanical grounds (*see* Discussion 19). The derivation of the word would not be a good botanical ground for making such a choice. In publishing the variety *Aristida capensis* var. *Dieterleniana* Schweickerdt (Kew Bull. 1939, p. 653) the author indicated (not without reason) *Celiers II* as the type and not *Dieterlen 1205*. In *Ormocarpum Kirkii*, SPRAGUE and MILNE-REDHEAD (Kew Bull. 1934, pp. 42–43) have shown that *Kirk's* specimen was imperfect and that the description was primarily based on *Hildebrandt 1935*. In *Poa amboinica* L., Mant. Alt. (1771) 557, though the specific epithet was derived from a Rumphian name, the validating description was based on an Indian specimen (both the Rumphian plate and the Rumphian description being pre–1753 should not have any status except that of a herbarium specimen and its manuscript description in the herbarium, none of which are admissible for effecting the validation of a name by reference). But apart from this, RETZIUS (Obs. Bot. iv, 1786, p. 20) recognized the *mixtum compositum* in the Linnean species and excluded from it the Rumphian syntype as the discordant element. This typification was generally accepted until challenged by MERRILL (Interp. Rumph. Herb, Amb., 1917, p. 88) on what are in my opinion erroneous assumptions. This challenge was upheld by FISCHER (Kew Bull. 1934, pp. 398–400) on the derivation of the trivial epithet of the specific name, and recently by AIRY-SHAW (op. cit. 1947, p. 36), because "Linnaeus adopted, from Rumphius, the geographical epithet *amboinica*". I contend that in the interest of stability and finality of names the typification made by RETZIUS should be adopted. (For criticism of Merrill's and Fischer's views see Furtado in Gard. Bull. Straits Settl. IX, 1937, pp. 297–298).

Another example worth considering is the typification of *Eranthemum L.* (1753) by SPRAGUE in Kew Bull. (1926) 98. Here SPRAGUE confuses the issue by saying that *E. capense* L. (1753), the only species under the genus, "was based on a plant collected in Ceylon by Hermann, and described by Linné under the name Eranthemum in Fl. Zeylan. 6 n.15 (1747) and Amoen. Acad. i. 384. In Sp. Pl. 8 Linnè unfortunately confused this with a Cape plant....." This statement of SPRAGUE suggests that the binomial *E. capense* was originally given to a Ceylon plant but that later LINNAEUS was confused and adopted the name also for a Cape plant. Actually *E. capense* was first instated in 1753 and it then included elements from two sources as far as the citation of references were concerned: Ceylon and the

Cape; but under the habitat LINNAEUS mentioned only "Aethiopia" which included the Cape but not Ceylon. In Species Plantarum (1753), which is the starting-point book for the nomenclature of the genus and its species, LINNAEUS need not employ Eranthemum in its pre–1753 sense; under the Rules he is free (retrospectively) to give the name in 1753 any sense he liked. If he applied it to a Cape plant, he cannot be said to have misapplied the name. Further since in Sp. Pl. (1753) the genera are validated merely by mention of the species (an exception to the usual procedure Art. 41 and Art. 42), Eranthemum, when typified, should include *E. capense.* However, those who follow RADLKOFER (Sitz. Kaiser. Bayr. Acad. XIII, 1883, p. 285 et annot.), KUNTZE (1890–98 and 1904) and SPRAGUE, and accept references back under the same name (invalidated under Arts. 42 (2) and 44 (2)), take Eranthemum as having been validated by reference to a previous description under the same name though this previous description and name had a different meaning. On this basis they typify the genus Eranthemum on the Ceylon plant mentioned by SPRAGUE above, but generally transfer the binomial *E. capense* sensu typico (the African plant) to another genus. In other words these botanists remove from Eranthemum L. (1753) the very binomial or species (*E. capense*) that validated the genus and is the type of the genus, a procedure quite contrary to Arts. 51–52 of the Rules.

The case of Eranthemum appears to be as follows: Before 1753, LINNAEUS based the genus on HERMANN's specimen from Ceylon; but in 1753 he found a specimen from the Cape which agreed well with his generic conception of Eranthemum. This specimen, which was also described by HERMANN in the reference quoted by LINNAEUS under *E. capense,* was from a plant grown from the seeds sent from the Cape by OLDENLAND. Could it not be that Eranthemum was wrongly attributed in 1747 to Ceylon? HERMANN had collected both in Ceylon and in the Cape, and many of his specimens were mixed in mounting. LINNAEUS, however, had not at the time HERMANN's Ceylon specimen with him to clear these doubts (fide R. BROWN, Prodr. Fl. Nov. Holl., 1810, p. 332). But he knew that the Cape plant was a new species and required a binomial under his new scheme. LINNAEUS therefore gave the Cape specimen the binomial *E. capense* and therefore mentioned only "Aethiopia" under the habitat, and excluded Ceylon though he gave a reference to the Ceylon specimen also. It is this binomial that validated the genus.

There was no mistake about the specimen being a new species or from the Cape. Reference to a previous description under the same name does not validate the genus (Art. 42–2), but serves to show its previous history. The mistake attributed to LINNAEUS is attributable only when references to previously published descriptions under the same name are admitted against Art. 42 (2), and LINNAEUS is deprived of the right to give in 1753 any sense he liked to a previous name. The genus Eranthemum should therefore be typified on *E. capense*, as this binomial validated the generic name; and this species not only included OLDENLAND's specimen from the Cape but was stated to be from Africa only.

It may be noted that ALSTON in Handb. Fl. Ceylon VI (1931) 226 and 228, uses Daedacalanthus R. Anders. and *D. fastigiatus* (Lamk.) Alston for Eranthemum L. *sensu* Radlkofer (1883) and *E. montanum* Roxb. respectively, and Pegafetta Adans. and *P. malabaricum* (Clarke) Alston for what has been called Pseuderanthemum Radlk. and *Ps. malabaricum* (Clarke) Fischer, thus retaining Eranthemum L. and *E. capense* L. for the Cape plant typified on Oldenland's specimen. A good deal of confusion made in these genera can be best removed by following ALSTON's typification of Eranthemum, especially when Pseuderanthemum has also been misused. (In a recent paper BREMEKAMP and NANNENGA-BREMEKAMP have typified both Eranthemum and *E. capense* on the Ceylon plant, but have not discussed the previous typifications (Nederl. Akad. Wet. Verh. (Sect 2) XLV no. 1 (1948) 33).

22. Later Homonyms

Types have been unnecessarily emphasised in the definition of a later homonym, so that it seems possible to reject an earlier valid name as "illegitimate" and to accept an identical later combination with a different authorship or date as legitimate. Thus, for instance, *Pseudotsuga taxifolia* (Lamb.) Britton (1889), although admitted as valid with a force to render a later name with a different type "illegitimate" (impriorable), has itself been rejected as "illegitimate" and considered without any force to render *Ps. taxifolia* (Lamb. ex Poir) Rehder (1938) "illegitimate", because the latter combination has the same type as the former; accordingly the latter combination has been declared as the legitimate (correct) name for the Douglas Fir (Sprague and Green in Kew Bull., 1938, pp. 79–80; for further similar examples *see* Furtado in Fedde, Repertorium XLIV, 1938, pp. 256–264).

But the Rules provide that an alteration in diagnosis and in circumscription, however considerable, but "without the exclusion of the type does not warrant the citation of an author other than the one who first published its name", though the authorship of considerable emendations may be indicated (Art. 47). In the aforementioned case, however, SPRAGUE and GREEN have given to the authorship of names an importance unwarranted under Art. 47, so that, under their view, the authorship would become an important part of the botanical name. They have overlooked the fact that the correct citation of authorship is not a problem that concerns validity, priorability or legitimacy of a name; it affects only its propriety. If the view of SPRAGUE and GREEN were valid, then the rejection of homonyms established by different authors would become meaningless.

This opinion of SPRAGUE and GREEN on homonyms does not accord with the spirit of the Commentary made by the British botanists responsible for the present wording of the rule of homonyms. Declaring that it is a sheer waste of time to oblige botanists to undertake critical research to find out whether or not a prior homonym is legitimable in a given position (p. 5), the Commentary states that "this Article prohibits the duplication of names which have been published with a description (or reference to a former description), even if they are *illegitimate*. It will stabilize nomenclature, especially in the numerous cases where there is doubt or dispute whether a prior homonym is illegitimate or not". (Brit. Proposals, 1929, p. 43). Professor REHDER states in the Preliminary Opinions, Amsterdam, 1935, Art. 47 bis, p. 14, that the meaning of a name "should be clear even without author citation, since the author is often omitted, particularly in applied botany and popular publications. We have to consider also the use of botanical names outside of strictly taxonomic work."

From the foregoing I conclude that the opinion held by SPRAGUE and GREEN on the legitimacy of orthographically similar names when an earlier one is rejected, cannot be maintained. Due amendments are therefore proposed to make the rule of homonyms more precise (*see* Arts. 61A–B and Art. 52B–D, and also discussion on superfluous names in 14–15).

However Art. 47 could be made more explicit as to the manner of citing the correct name for the Douglas Fir. From Art. 69 it looks as if *Ps. taxifolia* Britton (= *Ps. taxifolia* (Lamb.) Britton), and not *Ps. taxifolia* (Lamb. ex Poir.) Britton *emend.* Rehder or *Ps. taxifolia* (Poir.) Rehder, is the correct way of expressing the authority of the first valid and priorable instatement of the name.

23. Specific Epithets under an Impriorable Generic Name

Later homonyms, unless they be conserved generic names, are impriorable, that is, they are valid but cannot be included in priority considerations. This should have deprived specific epithets instated under an impriorable genus of the right of priority even outside the genus. Thus, since Rademachia Thunb. (1776) is a later homonym, the combination *R. integra* Thunb. (1776) can never be legitimately used, and so when THUNBERG established a new genus Sitodium (1779), the combination *S. macrocarpon* Thunb. (1779) should have been the legitimate name for the species. This procedure can be defended also under the strict wording of the present Rules which prescribe that only "legitimate" combinations (that is, those satisfying all the rules—Arts. 2 and 45) should be used in priority considerations. But as this procedure would not contribute to economy in specific epithets and would also lead to ignoring important contributions made to the systematy of the genera bearing names which are later homonyms, and since later homonyms themselves are made usually in ignorance of the existence of the previous homonyms, the modern tendency has been to allow priority to the specific epithets instated under an impriorable genus. Further it must be borne in mind that all specific epithets instated under an impriorable genus form an obstacle to the formation of exactly similar combinations under an earlier priorable generic homonym. These reasons therefore justify the custom of allowing priority to the specific epithets instated under an impriorable generic name. An appropriate amendment has been proposed in the Rules to clarify this problem.

However, an admission of priority to such epithets should not be mistaken as an opening for admitting as priorable, the specific epithets instated under no genus, or under an invalid genus, or under a generic name which was intended to be but was not actually instated. As the epithets instated under such circumstances are invalid, the question of their priorability does not arise. The invalidity of specific epithets under an invalid or no generic name might seem so axiomatic under the binomial binary system of nomenclature for species (cf. Linnaeus's Aphorisms 257 and 286 and comments on them in Critica Botanica), that one might well question the need of emphasising the fact here; but Discussion 24 will show that there are nomenclaturists who question the validity of the axiom, and that there is a definite attempt to amend the Rules so as to admit such specific epithets as valid. The reader should therefore bear in mind the status of specific epithets instated under a

valid but impriorable generic name, so that, in the following discussion, the distinction between it and the status of the epithets attached to no generic name or to a generic name that has no status under the rules may be clearly recognized.

24. "Binary" Names under an Invalid Genus

Art. 67 states the conditions under which a generic name must not be admitted even when otherwise it seems satisfactory under Arts. 25, 37 and 42. But since WALTER's "genus" Anonymos satisfies none of these Articles, there should not be any doubt of its being invalid, i.e. status-less under the Rules. In fact the legislators have singled out this term as an example of a word that cannot be considered as a valid generic name under Art. 67 (1); no further doubt should therefore arise about its invalidity. And it is obvious that, from the very definition of the binary name, the specific epithets instated under Anonymos should be equally invalid (cf. Linnean Aphorisms 257 and 286, and Art. 27 of the 1935 Rules). Yet SPRAGUE proposes that, in the following amendment, the Congress should state in the form of a rule that the specific epithets preceded by the word Anonymos are invalid even though the proposed rule applies to that particular word only:

> "Binary combinations of a specific epithet with the word Anonymos are illegitimate, since the word Anonymos is not a generic name (Art. 67(1)). Such combinations are not taken in consideration for purposes of priority of the epithet concerned.
>
> "Example: The binary combination, *Anonymos aquatica* Walt. Fl. Carol. 230 (1788) is illegitimate. The valid name for the species concerned is *Planera aquatica* J. F. Gmel. (1791), and the date of the epithet *aquatica*, for purposes of priority, is 1791. The species must not be cited as *Planera aquatica* (Walt.) J. F. Gmel. If, however, it is desired to indicate that the epithet originated with Walter, the name may be cited as *Planera aquatica* [(Walt.)] J. F. Gmel." (Kew Bull. 1939, p. 318, sub Art. 27).

The Rules empower the Congress to suspend, in certain cases, the application of the rule of priority; but even then it is better for the Congress not to exercise this power if the effects of the proposal can be secured by applying the existing rules (cf. Furtado in Gard. Bull. Straits Settl. IX, 1937, p. 253). But when the Congress is asked to give a special decision on a particular case and embody that decision in the form of a rule applicable to that case only, it is time for the Congress to call a halt and consider whether such a procedure might not create an undesirable precedent and affect seriously the normal practice. Moreover, special decisions, when given unnecessarily, and/or embodied in the form of a special rule applicable to that case only, often

mislead taxonomists into thinking that the results secured by a special decision or rule were otherwise not attainable. This sows a seed for the future misinterpretation of the rule applicable to the case. If the existing rule were invoked and the deductions were accordingly made, the decision would have reinforced the rule and prevented its future misinterpretation, a procedure, I believe, followed with great effect by zoologists. When advisable, the case could be cited as an additional example illustrating the application of the particular rule. Hence there are grave objections to adopting SPRAGUE's proposal. I note also that the editors (Camp, Rickett and Weatherby) of the 1947 special edition of the International Rules of Botanical Nomenclature object to cluttering the main body of the Rules "with decisions on individual cases" which "might very profitably be relegated" to appendices or to a series of opinions.

But apart from this novel way of trying to outlaw the alleged "binary" combinations (for the Congress has disapproved the principle for rejecting properly instated specific names) there are also serious objections to the wording of the proposal itself; for the invocation of Art. 67 (1) means that, since WALTER *did not intend* to adopt Anonymos as a generic name, the specific epithets cannot be taken to have been published validly. Thus put, the reason for rejecting WALTER's specific epithets under Anonymos misdirects the whole issue; for one conclusion from this premis would be that, had WALTER *intended* Anonymos to be a generic name, then 44 specific epithets published by WALTER under Anonymos would have been valid, despite the fact that Anonymos was never described as a taxonomic group to satisfy Arts. 37 and 42 or 43. So the word "binary" in Art. 27 would be synonymous with biverbal, in which sense SPRAGUE has used the word in the proposal. This would mean, therefore, that specific epithets could be validly instated under a status–less (invalid) generic name, a conclusion I have nowhere found seriously maintained except by a few botanists who use the word "binary" very loosely to mean biverbal (cf: Sprague and Riley in Journ. Bot. LXII, 1924, p. 7 and Sprague and Hubbard in Kew Bull. 1933, p. 15 and 1936, p. 319).

The principle involved in the above-mentioned proposal goes against the essence of binary binomial nomenclature itself. Its admission would defeat the very purpose of prescribing binary binomial nomenclature to species. In arguing the fallacy of this theory and the contradictions involved, I had also discussed the invalidity of the specific epithets proposed by WALTER under Anonymos, not only

under Art. 27, but also under the rule of *nomina vel epitheta provisoria*, for all these epithets were published in the hope that future botanists would put them under their proper genera, WALTER himself not having assigned them to any known genus. It is true that some botanists attributed the epithets to WALTER, but it has already been shown that such attributions are wrong (retrospectively) under the present Rules and that these epithets stand on the same footing as the (retrospectively) invalid names taken up from WALLICH's catalogue by subsequent botanists and attributed to WALLICH. WALTER's specific epithets were shown to have been validly instated by GMELIN (1791) and others, who therefore become the real authors of the epithets under the Rules. In such matters custom cannot be invoked in order to nullify a clear law (Furtado in Fedde, Repertorium XLIV, 1938, pp. 256–264).

By accepting the definitions of the terms binomial, binary and biverbal indicated in Discussion 2 of this paper, it becomes clear that a specific name which indicates only one description (unless that description be of the *descriptio generico-specifica* class) can be neither a binary nor a binomial, though it may be a biverbal. The specific epithets "instated" under Anonymos by WALTER, like such biverbals as *Villebrunnea integrifolia* Gaud. and *V. crenulata* Gaud. are, therefore, neither binary nor binomial, for in each case the combination indicates only one description. Hence these combinations deserve no recognition from botanists, though Villebrunnea was *intended* to be a generic name but never associated with any generic description (cf. Furtado in Bull. Jard. Bot. Buitenz. XVI, 1939, pp. 116–119). In fact Villebrunnea does not come under Art. 67 at all; for Art. 67 deals with names which are inadmissible under the Rules even when they are properly published and are accompanied by generic descriptions. It does not deal with cases where admissible generic names are not accompanied by generic descriptions, for the obvious reason that names without descriptions are invalid (Arts. 37 and 42). However it has to be admitted that the examples given in Art. 67 are not carefully chosen to illustrate the various points dealt with in the rule, and Anonymos is one of the ill-chosen examples.

The use of the word "binary", and the way of invoking Art. 67 (1) in the amendment proposed by SPRAGUE are therefore misleading. The epithets concerned are invalid (without any status) under the existing rules (*see* also Furtado in Philipp. Journ. Sc. LXIX, 1939, pp. 467–469). I contend therefore that the proposed amendment should not be approved.

As to the manner of citing the authority of an invalid name, when validated by another author, the subject is to be dealt with in Art. 48. But I doubt the advisability of quoting the author of an invalid name in a double bracket.

25. The Fallacies of Implicit References

In Kew Bull. (1937) 475–476, under the title of "Epipogum or Epipogium" SPRAGUE and GREEN have defended a procedure based on two fallacies, namely, (*a*) the incidental mentioning of invalid or provisional names constitutes a definite acceptance of the names, a procedure condemned by Art. 37; but, since this assumption does not carry one very far, for the names would still remain without a valid description, and, therefore, invalid, the second assumption is made, that is, (*b*) the name incidentally mentioned is validated by an implicit reference to a description published previously *under the same name.*

In disputing this theory of implicit reference, I submitted that, in order to decide whether or not the author wished to adopt an older name definitely, the easiest way was to apply the provision in Art. 42 (2), which clause, though ignored by the two authors, invalidates, like Art. 44 (2), references to previous descriptions *under the same name.* From 1905 this provision forms an important part of the Rules, being then introduced to proscribe principally the procedure defended by KUNTZE who, by admitting reference back under the same name to pre-1753 literature, had effected over 30,000 name changes (cf. Furtado in Gard. Bull. Straits Settl. X, 1938, pp. 162–72). Nevertheless, SPRAGUE has now made the proposal to omit the phrase *under another name* from both Arts. 42 (2) and 44 (2). As an approval of this proposal would cause many name-changes, and even remove the definiteness of many other names, a discussion on Art. 44 (2) may not be out of place here (the problems concerning Art. 42 (2) having been already dealt with in my paper referred to above). However it may be noted here that, when SPRAGUE states that many Linnean generic names have been validated by reference to pre-Linnean descriptions (Kew Bull. 1939, p. 323, sub Art. 42), he overlooks the fact that, under Art. 20, if any descriptions are to be associated with the Linnean genera of 1753 and 1762–63, they are the *first subsequent* descriptions in LINNAEUS's Genera Plantarum ed. 5 (1754) and ed. 6 (1764). Even if the phrase were omitted, the contention of SPRAGUE would, therefore, be erroneous as applied to the Linnean generic names.

In proposing to omit the phrase *under another name* from Art. 44 (2), SPRAGUE states that "this omission is required to provide for the case of a pre-Linnean binary specific name validly published by a post-Linnean author with reference to the pre-Linnean description." (Kew Bull. 1939, p. 323). This is a very misleading statement. The binary binomial system of nomenclature for species was consistently employed for the first time in 1753. In the case of biverbal specific names of pre–1753 authors, there are many doubts whether the names are merely binary or biverbal, or truly binary biverbal binomials. Sometimes they are biverbal generic names, and therefore unitary; in some other cases they are biverbal and binary but not binomial; in many cases the names are biverbal binomial for forms and varieties, and so not binary; or when binary and binomial, the genus is based on characters of habit and uses, not on floral characters. This difficulty is met with also in the case of those post–1753 books in which the Linnean binomial system was not consistently adopted. To obviate this difficulty the Rules have interdicted all the specific names in such books, even those post—1753 names that seem to be clearly binary, biverbal binomial specific names (Art. 68 (4); also Furtado in Bull. Jard. Bot. Buitenz. XVI 1939, pp. 116–119). Judging from the loose sense in which the term "binary" has been employed, the tendency to admit such names would still be great if the clause *under another name* were omitted. Furthermore, LINNAEUS, Spec. Pl. (1753) and (1762–63) are taken as a sort of check-list wherein are registered all the species till then known to science, and wherein characters are shown in order to be able to distinguish between them. Should a pre–1753 species having a binary, biverbal binomial name be found not to have been taken up in the many editions of *Species Plantarum* and in other descriptive check-lists (e.g. Lamarck's *Encyclopédie,* Persoon's *Synopsis Plantarum,* and Don's *General System of Botany and Gardening*), it would be better now to deny validity to such names even though the names were *registered* or *casually mentioned,* but *not described,* in some lists, catalogues, theses, itineraries or discussions; many name-changes and complications would result by allowing validity to these names (cf. Furtado, 1938 cited above).

Thus, for instance, many pre–1821 names of *Fungi Caeteri* recorded in STEUDEL's *Nomenclator* (Cryptogamia) (1824), would have to be revived if the phrase *under another name* were omitted from Art. 44 (2). The many involved arguments and assumptions made for getting *Poinciana spinosa* admitted as valid (Sprague in Kew Bull.

1931, pp. 91–96) could be easily disposed of by referring the whole question to Art. 44 (2) which SPRAGUE has ignored and which he now seeks to eliminate from the Rules. In all such cases the clauses Arts. 42 (2) and 44 (2) are so to say labour-saving devices for botanists who might have otherwise to consider lengthy arguments before deciding the validity or invalidity of names. By way of illustration I shall discuss at some length the case of *Petroselinum crispum*:

In the Kew Hand List of Herbaceous Plants ed. 3 (1925) 122, the name *P. crispum* Nym. is listed without any description. No one is bound to take any notice of it, because it has not been published before as a valid name, nor is there given under it any definite reference to a previously valid description. But AIRY-SHAW discovered that the name was published in 1879 as a synonym of *P. sativum* Hoffm. and that it was apparently intended to be an isonym of *Apium crispum* Mill. This does not carry one any further, for combinations published in the synonymy are inadmissible (Art. 40), a fact also admitted by AIRY-SHAW though he allowed validity to *P. crispum* Nym. in the following manner:

> But the combination has been taken up in the Kew Hand List of Herbaceous Plants ed. 3,122 (1925), and attributed to Nyman; and it appears that it must be regarded as validly published in that place (cf. Sprague and Green on implicit citation in the case of the generic name *Epipogium*, in Kew Bull. 1937, 475) (Kew Bull. 1938, pp. 256–258).

Later AIRY-SHAW's attention was drawn to the fact that *P. crispum* (Mill.) Nym. was a binomial combination published for a variety under *P. sativum* Hoffm.; and AIRY-SHAW admits that "varietal binomials" are inadmissible under the present nomenclatural system (Art. 28). But under the theory of implicit reference he finds the following way out of this difficulty:

> The first valid use of the combination *Petroselinum crispum* (i.e. for a species) is apparently in the Kew Hand List of Herbaceous Plants 122 (1925), and the attribution to Nyman may be taken as validating reference to Nyman's well-known work, where the author of the name-bringing synonym, *Apium crispum* Mill., is cited in brackets. There is clearly no doubt as to the plant intended either by Nyman or by Miller, nor as to the works of those authors intended by the Kew Hand List and by Nyman respectively (Kew Bull. 1939, p. 168).

It may be remarked here that the question of validity or invalidity of a name is not decided by doubts, or the absence of doubts, about the plant intended; otherwise almost all the names in WALLICH's Catalogue would have been valid, for they were accompanied by numbered sets of plants distributed to many botanical institutions. The

alleged obviousness of the work intended by the compilers of the Kew Hand List is not as easy to understand as AIRY-SHAW imagines, for compilers of such Hand-lists do not usually consult original works, but go by herbarium determinations. Often invalid combinations get unwittingly into such Lists. It is more probable that the compilers had never intended to publish a new name, nor to refer to any work, but had merely adopted *P. crispum* Nym. because of the authority of the botanist who had determined their specimens in the herbarium. What the determining authority intended by the binomial is not easy to decide; the binomial might have stood for the variety as named by NYMAN. If such listings are admitted as valid publications of names, then one could also argue that: all pre-starting point names; the names published in works wherein the binomial system has not been consistently employed (Art. 68–4); provisional names; and invalid manuscript names cited in the synonymy, become valid when they are registered in subsequent indexes or nomenclators. Further the mere registration of varietal binomials as if they were specific names would also constitute the valid publication of the binomials as specific names. Even a casual mention of such an invalid name and its author by a careless worker would oblige botanists to admit it as valid and investigate as to what it originally meant, where it was published, the Rules making no distinction between well-known and less known works. This would mean that botanists should possess a list of all the invalid names published before and after the starting points, despite the fact that such names have no status under the Rules. Perhaps the compilers of such lists would then be considered as the real validating authors of the invalid names, since the mere registration has been claimed to give validity to previously invalid names.

From the foregoing it is evident that numerous complications will arise by omitting the phrase *"under another name"* from Art. 42 (2) and 44 (2). This phrase was intentionally inserted in the Articles of the 1905 Rules. If the phrase were retained in Art. 42 (2), many of the proposals to conserve generic names already in use would be unnecessary. Thus the proposal to conserve *Hippeastrum* Herbert (1821) versus *Leopoldia* Herbert (1821) made by SEALY to the 1940 Congress (Kew Bull. 1939, pp. 49–68 and 328) becomes meaningless, for what is already valid and legitimate does not require to be conserved versus a name which, under the existing Rules, has no status and no claim to recognition by botanists (invalid).

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26. Alternative Names and the Will of the Congress

Discussing the simultaneous publication of *Cymbopogon Bequærtii* De Willd. (1919) and *Andropogon Bequærtii* De Willd., CROIZAT (Journ. Arnold Arb. XXII, 1941, pp. 133–142) states as follows:

> De Willdeman believed either that these two names were synonymous in the accepted sense, or that they were not. If he did believe that the names were synonymous, he erred in publishing two names where one was sufficient, the other being superfluous (Art. 16, Art. 60(1)), or illegitimate (Art. 40); if he did not believe, he clearly acted to design a new combination in anticipation of the eventual acceptance of the group, which is a patent violation of Art. 37*ter*, and creates a *nomen provisorium* (p. 137).

The first part of this argument is faulty, because the two names, being in a different position, cannot be "superfluous" under Arts. 16 and 60 (1). As to the second part, Art. 40 does not apply because *Andropogon Bequærtii* was not "merely cited as a synonym"; it was published as an alternative name to *Cymbopogon Bequærtii*, in order first to indicate that there are two current views about the major taxonomic group, both accepted as taxonomically valid, and then to prevent name-changes being made by others which could be done by the author himself. In discussing this principle in some detail, I had mentioned the complications made by persons who were after easy honours (Gard. Bull. Straits Settl. IX, 1937, pp. 239–240). But I have also come across some examples where botanists, in order to avoid criticisms of the type levelled by CROIZAT, have published the names in one periodical, and the alternative names in another, making it thereby difficult for workers on the groups to collect the necessary references. DE WILLDEMAN could have published either of the two names, and botanists would have accepted the name as valid; and CROIZAT himself would not have any objection to accepting the second name had DE WILLDEMAN published it after the first. CROIZAT's objection is because the two names have been published simultaneously and have saved workers the trouble of looking up two different periodicals for the information that could have been obtained in one.

As to the third part of the argument offered by CROIZAT, that alternative names are provisional, to be outlawed under Art. 37 *ter*, it must be recalled that this point received a good deal of consideration from the Congress at Amsterdam. The President (Dr. E. D. MERRILL) pointed out that the provisional names were against the spirit of the Rules, but that alternative names were not provisional names. From the Proceedings it is

evident that the Congress was of the opinion that, if alternative names were placed on the same footing as provisional names, then none of the alternative names could be accepted as validly published. Thus, in the case discussed both *Andropogon Bequærtii* and *Cymbopogon Bequærtii* would have to be rejected. In view of this and also in view of the complication that would arise as to the authorship, Prof. W. ROBYNS "suggested that, as a matter of practical convenience, such alternative names should be treated as valid", and later amended the proposal by eliminating the word *"seu eventuale"* which, according to the discussion recorded in the Proceedings, referred to alternative names. The proposal thus amended was adopted by the Congress (Proceed. I, 1936, pp. 364–366).

There was no other decision to validate alternative names; but the fact that a proposal to reject both provisional and alternative names was amended with the express object of excluding alternative names from the effects of the proposed rule is a sufficient proof that the Congress regarded alternative names as valid. This conclusion is further strengthened by the different summaries of the decisions taken at the Congress, published in Chron. Bot. II (1936) 38, Journ. Bot. LXXIV (1936) 75 and in Kew Bull. (1936) 186. I have not seen any correction issued to these announcements or to the Proceedings.

It is true that the wording of Art. 37 *ter* is not happy. That the definitions of provisional and alternative names require further clarification so as to prevent conflicting interpretations of the rule was pointed out in my paper quoted by CROIZAT (Furtado in Gard. Bull. Straits Settl. IX, 1937, pp. 230–232 and 239–240). And this faulty wording of Art. 37 *ter* is now the sole basis of CROIZAT's not interpreting the Article on the evidence made available in the discussion that preceded the approval of the rule in the present wording. Hence CROIZAT concludes that the summary given by SPRAGUE of the Congress decisions is erroneous as far as alternative names are concerned, and therefore maintains that Art. 37 *ter*, as approved by "sovereign will of the Congress" invalidates precisely those names to safeguard which the original proposal was amended.

Previous practice of quoting alternative names was very conflicting, a fact also made obvious during the discussion of Art. 37 *ter* at the Congress. Hence the way in which an alternative name has been registered in Index Kewensis cannot be invoked as illustrating an "established custom" under Art. 5. Were a name invalid (without any status under the Rules), the editors of Index Kewensis should not

have registered it at all. Besides, alternative names have not been uniformly registered in Index Kewensis, e.g. *Syzygium paniculatum* Gaertn. and *Eugenia paniculata* Banks *ex* Gaertn. (1788), *Claytonia Washingtonia* Suksdorf vel *Montia Washingtonia* Suksdorf (1898) and *Lithocarpus* vel *Pasania Rodgeriana* A. Camus (1931). Further if the previously established custom did not approve of these alternative names, then botanists like DE WILLDEMAN could be said to be the breakers of the custom; but the opinion that "any subsequent author who took up the name *Andropogon Bequaertii* would certainly attribute it to DE WILLDEMAN" (an opinion voiced at the Congress both by ROBYNS of Bruxelles and HANDEL-MAZZETTI of Vienna), shows that the previous "established custom" was not what CROIZAT has it to be.

In view of this the botanical public is justified in considering that the Congress has not only accepted alternative names "as a matter of practical convenience", but also condemned expressly the provisional names. Our endeavour, therefore, should be to find a more appropriate terminology for framing the rule in such a way that the "sovereign will of the Congress" shall be unequivocal.

BAILEY (Gent. Herb. II, 1932, pp. 430–433), who upholds the validity of alternative names and quotes many instances, pleads that the Congress should be more precise in defining what a synonym is, so as to prevent confusion between alternative names and synonyms. He cites an instance of an extreme form of multiple nomenclature which, I believe, is rare: *Sedum-Cotyledum-Echeveria-Diodostemon clavifolia* Alwin Berger in Gartenflora LIII, p. 205. It is possible that many alternative names published in the last two centuries have been overlooked, and if their resuscitation now would cause confusion and if there is no way of distinguishing between synonyms and alternative names published in early literature, it would be advisable to consider all long overlooked or ignored alternative names published before 1905 as invalid, and to oblige authors in future to indicate in a definite way whether a certain name is alternative or a synonym (cf. Linnean alternative combinations published under *Melilotus* sub *Trifolium* which have been long ignored).

27. Responsibilities of Publishers

The 1930 Congress decided that the validity of a paper reserved for private circulation should not be admitted unless distributed to the institutions to be specified under the Rules; and I tried to show that, unless this specification included certain institutions interested in the work and

unless the distribution were made through a Committee, grave complications would certainly arise (Chron. Bot. III, 1937, pp. 337–339, and in Gard. Bull. Straits Settl. IX, 1937, pp. 273–279). In the latter paper a scheme was worked out so as to secure a priority in distribution for the interested institutions; for I believe validity should not be allowed to a paper, say on the Indo-Malaysian flora, if the distribution to all the Indo-Malaysian institutions is refused or ignored by the idiosyncratic author of the work meant only for private distribution. A distribution to institutions not interested in the work serves no useful purpose; these institutions may even destroy the books which are useless to them. If such a Committee had regional representatives in different parts of the world, the principle would have worked even during the last great war. The regional representative could have undertaken to reserve copies for other institutions to which copies could not be sent owing to war.

However there is now a move to abandon the specification of the institutions required in Art. 36. If the list is to be abandoned, the responsibilities of publishers and/or of authors must be clearly stated; for, owing to the high cost of printing and to the paucity of funds, there is a great danger of systematic papers being published in periodicals least likely to come to the attention of the interested public (cf. examples in Gard. Bull. Straits Settl. IX, 1935, p. 113 and XI, 1939, p. 21 sub Art. 36).

There is also the question of separates. These offer the author an effective means of establishing an exchange with his colleagues. Many publishers, in order to secure first class contributions to their periodicals, are therefore obliged to supply to the author gratis a certain number of separates of the paper. But satisfying the demands of the individual contributors and sending a few complimentary copies for reviews or to some institutions are not synonymous with meeting the nomenclatural requirements for rendering the contributions effective (valid). The demand by authors for separates is for a subsidiary distribution, that is, a distribution having nothing to do with valid publication of the papers. Were publishers of the periodical to make the authors individually responsible for the measures necessary to render the contributions valid, then authors themselves would individually be the publishers of their own contributions (assuming the authors take the measures in question), and the periodical would be merely a review in which the papers are published at second hand (and often with fictitious dates, because the editors of the periodicals would not know when the authors "published" their separates).

Under such circumstances, in giving references to a new nomenclatural entity, the title and the page of the pamphlet, and not the title and the page of the periodical wherein the contribution was subsequently reprinted or incorporated, would have to be cited.

Further, without advertisements, there would be great difficulties not only in subscribing to the papers, but in preventing ineffective (invalid) papers from being passed as effective and at wrong dates. In the case of large books, the publishers are interested in the disposal of the books, at least in order to recoup the initial outlay in printing; so they feel the need of issuing advertisements in due time. But in the case of separates the author does not incur any expenses, nor is he interested in the sale of the separates. In fact any attempts to advertise the sale of a few separates received gratis may involve the author or his agents in financial difficulties. Notwithstanding this aspect of the problem, it has been recently contended that, when advance prints are supplied to the author, the publishers are justified not only in calling these prints "advance separates" of the periodical, but also in reckoning effectiveness from the date on which the prints were supplied to the author.

It is obvious therefore that publishers must be made to realise that to publish a botanical contribution does not mean to print and/or distribute it to special persons or institutions only; but it means that the publication must be made available *in due time* to the interested botanical public. It is evident that no objections are raised for publishing a large work in small parts or fascicles, provided these are made available to subscribers in due time; but publishers cannot transfer their responsibilities of securing validity to the paper to the author by supplying him a few copies of his paper in advance, nor is this duty fulfilled if, in addition to supplying the copies to the author, six copies are sent to be utilised in herbaria or to be reviewed in periodicals. Since at least one institution has offered this as a plea for not sending its periodicals in due time to the subscribers (by purchase or exchange) (Hochreutiner in Candollea VII, 1938, p. 517), it seems necessary to legislate on this point so as to prevent such procedures in future. Necessary amendments have therefore been proposed to deny validity to papers for which no steps have been taken to insure their distribution in due time to the interested public.

28. Orthography of Names

In Gard. Bull. Straits Settl. XI, 1939, pp. 4–7, I suggested that the subject of orthography of names be referred to a special committee, so that the question of such

cognate subjects as that of homonymy and tautonymy might be considered at the same time; for in this matter simplicity and clearness are essential to avoid equivocation. Thus, for instance, if *Nasturtium Nasturtium-aquaticum* is a tautonym under the Rules (Art. 68–3), then the binomials *Asplenium Trichomanes* and *A. Trichomanes-dentatum* are a pair of homonyms; for a tautonym is nothing but a binomial where specific epithet is homonymous with the generic name (SPRAGUE's contention that *A. Trichomanes-dentatum* is "intrinsically invalid" under Art. 27 does not merit consideration cf. Furtado in Philipp. Journ. Sc. LXX, 1939, pp. 197–198). As numerous proposals have since been put forward regarding the orthography of botanical names, I may be excused for adding here a few more remarks on this subject (cf. also Furtado in Gard. Bull. Straits Settl. IX, 1937, pp. 249–255 and 256–258).

In the examples in Art. 70, *Sarauja* Willd. is said to be a typographic error for *Sarauia,* because WILLDENOW always adopted the latter spelling in his herbarium. This is a surprising statement, since in German (and WILLDENOW was a German) *i* and *j* have the same phonetic value, and in the manuscript *i* may be written where *j* would be employed in print. Both in German and later Latin *j* is preferred instead of *i* when it is at the beginning of a syllable. Thus *J*esus, *J*ohannis, *J*uventus, Ma*j*us, Mala*j*anus and Cu*j*us are used instead of *I*esus, *I*ohannis, *I*uventus, Ma*i*us, Mala*i*anus and Cu*i*us; and in dictionaries it was customary to list alphabetically under *I* all names commencing with *I* and *J*. Even in Linnean books one finds *J*acca, *J*acobaea, *J*asminum and *J*atropha indexed before *I*biscus, *I*llex, *I*mpatiens and *I*schaemum, and the latter are followed by *J*uglans, *J*uncus, *J*uniperus, *I*va, *I*xia and *I*xora. In view of this SARAUJA (spelt with J) cannot be considered to be a typographic error, and has therefore to be adopted as correct.

In modern patronymics, it is better to form genitives as given in Recommendation XL (a) and (b) of the Rules, even when the word has a special genitival and adjectival form in Latin. It is better, for instance, to get from *Clemens* the forms *Clemensii* and *Clemensiae,* and adjectives *Clemensianus-a-um,* than to use *Clementis* which is the genitive for both genders and also an adjective; by employing the alternative Roman method of making personal names from adjectives, *Clementinii* and *Clementinae* (genitives) and adjectives *Clementinus-a-um* are obtained. Similarly in *Magnus,* which has a generic name *Magnusia* (see Rec. XXXIX–a), it should be preferable to have the

genitives *Magnusii* and *Magnusiae* and adjectives *Magnusianus-a-um* than *Magni* and *Magnae* and adjectives *Magnus-a-um* (which are confusable with ordinary adjectives). In modern patronymics if *Franciscus* and *Augustus* have yielded the generic names *Francisca* and *Augusta*, then the genitives should certainly be *Francisci, Franciscae* and *Augusti, Augustae,* with adjectives *Franciscanus-a-um* and *Augustanus-a-um* (or perhaps *Augustinus-a-um*). As to *Alexander*, the genitives *Alexanderi* and *Alexanderae* and the adjectives *Alexander(i)anus-a-um* would eliminate confusion with derivatives from the word *Alexandria.* In view of this the proposals made by GREEN (Kew Bull., 1939, pp. 325–236) to eliminate *Magnusii* from the example in Rec. XL (b) and to make other alterations seem to have been based on wrong conceptions.

The specific epithet in *Libertia Laurencei* Hook. f., was latinized according to the old method by substituting *u* for *w*. Here the original spelling seems to have been intentionally adopted. In the Rules (Art. 70) this example is given as a case of unintentional orthographic error, though it compares very well with *Clutia* where the spelling was intentional, though the word was derived from *Cluyt,* and *Cluytia* was subsequently proposed as the correct spelling of the name.

29. Tautonyms and Generic Homonyms

While dealing with "Tautonyms and Homonyms" in Gard. Bull. Straits Settl. IX (1937) 249–253, I submitted that the rules regarding tautonyms and generic homonyms were so constructed as to mislead even the best nomenclaturists. I quoted the decisions given by some leading nomenclaturists in Kew Bull. (1935) 341–544 to show "a complete absence of uniformity in principles". In some cases earlier names have been rejected apparently as "superfluous" (despite their clear validity), in order to make room for admitting exactly similar later names as non-homonymous, legitimate names. *Wendtia* DC. (1830), for instance, has been rejected because it was an unwarranted correction of *Wendia* Hoffm. (1814), and so *Wendtia* Meyen (1834) has been accepted as the legitimate, non-homonymous name for another group. More recently, contradictory decisions have been given by ENSIGN in Amer. Midl. Nat. XXVII (1942) 501–511 and HAROLD ST. JOHN in Proceed. Biol. Soc. Washington LV (1942) 109–112 in the case of *Glossopetalum* Schreber (1789) and *Glossopetalon* A. Gray (1853). Such conflicting views are

possible because the Rules are not clear on these points. As to generic homonyms, I shall let St. JOHN speak:

> This [Art. 70] expands the brief, definite provisions of the earlier Vienna (1905) Rules, introducing qualifications and many examples. Unfortunately, some of these examples were ill chosen, and as listed partially confuse the applications of the law. Many times the writer has studied this new wording and he has tabulated the examples hoping to find complete agreement and clarity, but in vain. (op. cit., p. 110).

Further, since a tautonym is a specific name with its specific epithet homonymous with the generic name, and since little variations in specific epithets do not create new distinct epithets, the rule that outlaws tautonyms has been also one of the fruitful causes of conflicting decisions in nomenclature (cf. Furtado in Gard. Bull. Straits Settl. IX, 1937, pp. 249–255, and also *Bambos Bambos* and *Bambusa Bambos*). I have therefore proposed the deletion of the rule altogether so that tautonyms should be valid in future (Gard. Bull. Straits Settl. XI, 1937, pp. 4–7). But in order to get at the bottom of the principle involved in the examples of generic orthographic variants and homonyms, it would be better (despite St. JOHN's remarks) to analyse here the names which, though having the appearance of homonyms, have been quoted in the Rules as examples of different, non-homonymous generic names:—

1. RUBIA: a feminine noun derived from the Latin *ruber-ra-rum*, meaning red.
   RUBUS: a Latin name for blackberry, masculine in form.
2. MONOCHAETE: a proper noun from Greek *mono* (one) and *chaete* (flowing hair), feminine.
   MONOCHAETUM: a latinized adjective, neuter in form, from *monochaetus-a-um* (with flowing hair) used as an adjectival noun.
3. PEPONIA: feminine form of *peponius-a-um* from *Pepo* (a pumpkin).
   PEPONIUM: a neuter form of *peponius-a-um*.
4. IRIS: A Greek plant name, feminine.
   IRIA: probably a Malabar plant name, feminine.
5. DESMOSTACHYS: a proper noun from *desmos* (bond) and *stachys* (ear of corn), masculine in form.
   DESMOSTACHYA: an adjectival noun, feminine in form, from latinized adjective *desmostachyus-a-um*.
6. SYMPHYOSTEMON: from *symphysis* meaning to grow together, coalesce.
   SYMPHOSTEMON: from Greek *symphys* meaning to bring together, cause to grow together.
7. GERRARDINA: from a Natal plant-collector, GERRARD.
   GERARDIINA: from *Gerardius*, a latinization of LOUIS GERARD.
8. DURVILLEA: from J. E. C. D'URVILLE, the preposition having been joined to the surname that follows.
   URVILLEA: from J. E. C. D'URVILLE, but the preposition preceding the name is omitted.

9. ELODES: a masculine noun from Greek adjective *helodes* (marshy).
   ELODEA: a feminine noun from Greek adjective *helodes*.
10. PELTOPHORUS: a masculine form from *peltophorus-a-um*.
    PELTOPHORUM: a neuter form from *peltophorus-a-um*.

None of these are therefore merely orthographic variants of the same name like *Phoradendron* and *Phoradendrum, Anadendron* and *Anadendrum* and *Dysoxylon* and *Dysoxylum,* in which the second form is nothing but the first name with its termination latinized, and both retaining the same derivation and gender. Such names, though not mentioned in the examples as orthographic variants under Art. 70, are mentioned as examples of the two different spellings of the same name in Art. 71 (3) where *Rhododendron* and *Rhododendrum* are given as examples. Perhaps the phrase "and other epithets" in Art. 70 (4) was meant to cover these variants also. The Rochester Code, which retains the generic names even when they differ slightly unless this difference be due to "the spelling of the same word", gives *Epidendron* and *Epidendrum, Asterocarpus* and *Astrocarpus* as examples of orthographic variants, but quotes *Apios* and *Apium* as examples of good, non-homonymous generic names, presumably because of their different gender. The names *Anodendron* DC. (1844) (Apocynaceae) and *Anadendron* Schott (1857) (Araceae) are somewhat on a different footing, the prefixes being derived from two different Greek words, though both having almost the same meaning: *ano* (upwards) *ana* (up). These two names have always been considered as good non-homonymous generic names, though they are not mentioned as examples in the Rules.

In view of this it would avoid confusion if Art. 70 were amended so as to include both Art. 71 and the principles deduced above. At present those who consult Art. 70 overlook the fact that that rule is not complete without Art. 71. The pertinent clause affecting the generic names discussed here could be stated thus:

> **Art. 70 Note 4 (*a*) : Generic names of Greek origin differing merely by having Greek and Latin terminations respectively, but involving no change in gender or parts of speech are orthographic variants or homonymous names; where a change in terminations indicates a difference in gender or accidence, the generic names must be considered as different, non-homonymous names.**

This modification would clarify the rule of generic homonyms and would call for a revision in the nomenclatural decisions given by the different experts in Kew Bull. (1935) 341–544 (*see* my aforementioned paper 1937). It would also show that *Glossopetalum* Schreber (1789) and *Glossopetalon* A. Gray (1853) are homonymous names, being the

same name used twice in different senses. Though the former is unusable, being a later synonym of *Goupia* Aubl. (1775), the conservation of the latter is undesirable because both homonymous names are of the same family Celastraceae and occur in neighbouring regions, Mexico and Guiana. These two reasons combined would have been sufficient to demand the rejection of one of the two names even if they were not homonyms, in order to avoid errors, confusion and ambiguity in any treatment of the plants. In view of this, *Forsellesia* E. L. Greene (1893) is the correct name for *Glossopetalon* A. Gray. This decision accords with the treatment given by ENSIGN (1942), but conflicts with that given by ST. JOHN (1942).

30. Proposed Amendments to the Rules of Nomenclature

[Where the letter *A* follows the number of an Article, the amendment refers to the text of that Article in the existing Rules. Where other letters are used, the amendments are additions to, or transpositions of, the Rules. Where a letter is followed by *bis*, the amendment or addition refers to the Article amended in my previous Proposals in Gard. Bull. Straits Settl. XI, 1939, pp. 1–30. The Discussions with numbers refer to the Discussion preceding the Amendments in the present publication].

ART. 1A: ADD: The precise system of nomenclature on which an international agreement has been secured shall be known as the LINNEAN SYSTEM OF BOTANICAL NOMENCLATURE, hereinafter referred to merely as the LINNEAN, BINARY or BINOMIAL SYSTEM. This system is generally biverbal for species.

[Various designations are in use to name species, but nowhere in the Rules has the system been named. This addition meets the deficiency].

ADD: **NOTE 1:** (*a*) A *binary* name denotes two concepts, the first generic and the second specific; under the Rules these two concepts must be associated with two separate descriptions, though under certain conditions these two descriptions may be combined into one (*descriptio generico-specifica*).

(*b*) A *binomial* is a combination of two epithets, each of which stands in place of a description. The terms *binomial* and *binominal* are interchangeable.

(*c*) A *biverbal* name consists of two words; sometimes each word may be formed of two words united with a hyphen.

Examples: The consistent employment of binary binomials for species began in Linnaeus, Species Plantarum (1753); only occasionally these binomials are not biverbals (the Rules have

provided for making them biverbal names). Many varietal names in GANDOGER's Flora Europæ are biverbal binomials, but are not binary, because, though the first epithet stands for a generic description, the second stands for the description of a variety. Many specific names in HILL's Herbal are binary biverbals, but not binomials; many others are binary but neither biverbal nor binomial.

ART. 2B bis: REVISE: The *rules* are divisible into three main categories according as they pertain to (*a*) validity, (*b*) legitimacy, and (*c*) propriety of names.

(*a*) The *validity* rules determine when a name shall have a claim to recognition by botanists, and so they treat of: (*i*) the admissible order of the different categories of taxonomic groups; (*ii*) the formation of names to denote these different categories; (*iii*) the nature of the description or citation with which a name or its epithet is to be associated; and (*iv*) the nature of the publication wherein the descriptions and names are published. Names instated in violation of any one of these rules are *invalid*, having no status under the Rules (Art. 19A).

(*b*) The *legitimacy* rules decide the correct name for a given taxonomic group in given circumstances (Art. 16A), and so deal (*i*) with the priorability and impriorability of names and epithets (Arts. 52B-F), (*ii*) with the use of a name or epithet on transference of a taxonomic group from one nomenclatural position to another (Art. 53A bis), and (*iii*) with the claims of two or more priorable names or epithets for the same taxonomic group (Art. 56A bis.). Names in use contrary to any one of these rules are *illegitimate*.

(*c*) The *propriety* rules decide (*i*) the correct spelling of names and epithets, (*ii*) the correct gender of these names and epithets, and (*iii*) the correct manner of citing the names both of the author who first validated the names and epithets denoting the taxonomic groups, and of the author who first placed the epithets in their correct position. Nomenclatorial expressions offending any of these rules will be *improper*; these offences affect neither the validity nor the legitimacy of the names and epithets.

ARTS. 10–12

[Arts. 10–12 must be revised. Nomenclature does not deal with individual plants as individuals; they are dealt with as representative of taxonomic groups. In Art. 18 the lowest representative of a taxonomic group is the type specimen. For

reasons stated in Discussions 13–14 and 17 references to *individuum*, wild plants, hybrids, etc. are eliminated from the Rules as amended below].

ART. 10A: REVISE: The classification under the Linnean system so far recognizes the following ranks or categories of taxonomic groups enumerated in their descending order: Regnum vegetabile, Divisio, Subdivisio, Classis, Subclassis, Ordo, Subordo, Familia, Subfamilia, Tribus, Subtribus, Genus, Subgenus, Sectio, Subsectio, Species, Subspecies, Varietas, Subvarietas, Forma and Subforma.

NOTE 1: If this list of categories is insufficient, it may be augmented by the intercalation of supplementary categories provided that this does not introduce confusion or error.

Examples: *Series* and *Subseries* are categories which may be intercalated between section and species.

NOTE 2: (*a*) These categories of groups shall be classified philosophically as follows: NECESSARY (essential to the binary binomial system) and ACCESSORY (non-essential to the system). The Necessary groups may again be divided into FUNDAMENTAL and NON-FUNDAMENTAL; and the Accessory into SUBDIVISIONARY and DISJUNCTIVE.

(*b*) The FUNDAMENTAL NECESSARY groups are the Genus and the Species; only on these two the entire binomial system has been built. The NON-FUNDAMENTAL NECESSARY groups are family, order, class and divisio; at one time these groups did not exist in the Linnean system, though now they are necessary to phylogenetic taxonomy of the Fundamental groups.

(*c*) The ACCESSORY groups, though not essential to the system, are useful. The SUBDIVISIONARY groups divide a superior group into *two or more* parts in order to show the affinities of the inferior groups under the superior group; a Subdivisionary group itself is permitted to be again divided and subdivided into subordinate groups according to convenience (Note 1). Subdivisionary groups can never be less than two under their immediate superior group. Prior to 1930 Subspecies were both Subdivisionary and Necessary, but now they are only Subdivisionary groups (Art. 37A bis Note 5).

(*d*) DISJUNCTIVE groups, which include varieties and subvarieties, represent minor *deviations* from

the standard established by the type specimen, varieties being minor deviations from the species sensu stricto, and subvarieties from varieties sensu stricto.

Forms and Subforms (which are distinguished on characters either permanent and hereditary, or transient, or acquired under special conditions), may be distinguished as *forma* and *subforma biologica, specialis, juvenilis, adulta, cultigena, hybrida, apomicta, choronomica,* etc. These are not taxonomic groups in the proper sense of the word, and their names being admitted as special subjects to the nomenclatural rules, shall not interfere with the priority or homonymy of the names of superior groups.

Rec: I and **II** are to be retained.

ARTS. 11–13: DELETE. Incorporated in Art. 10A and in Art. 2B bis.

ART. 14: DELETE. *See* Discussion 14, and also remarks on Arts. 10–12 above.

ART. 18A bis: DELETE the last sentence of the first para. (*See* Discussion 18).

TRANSFER the second para. with the examples to Art. 50B; it forms a special rule.

REVISE the first sentence of the NOTE as follows: "The nomenclatural type does not necessarily represent a group which is genetically the most simple, phylogenetically the most ancient, ecologically the most common, taxonomically most polymorphic, or physiologically the most perfect." (*See* Discussions 19–21 & 25 and Art. 20A).

Rec: IV, V and **VI:** TRANSFER to Art. 50B as Rec. XXXIIB, XXXIIC & XXXIID.

Rec: VIIA: OMIT the word ("type") (Discussion 17).

ART. 19A bis: ADD: **"Note 1.** The generic and/or specific names from works wherein genera and species have been treated in an unorthodox terminology on philosophic grounds but have nevertheless been given the correct forms of botanical names, shall be admitted as valid under the Rules, provided they were so admitted by contemporary botanists, or in the subsequent editions of Linnaeus Sp. Plantarum. The same principle shall be applied to the names of other taxonomic groups."

Examples: (1) NECKER's philosophical ideas on classification are rejected because he called the Linnean genera and species as species and proles respectively; but NECKER's names for the Linnean taxonomic groups (genera) were correctly formed and admitted as valid by contemporary

botanists. These generic names shall therefore be admitted as valid under these Rules. The same principle applies to ADANSON's genera.

(2) FRIES's sectional or subgeneric names are in the correct form and were admitted as valid by contemporaries, though FRIES had called his subgeneric subdivisions "tribus". Hence they shall be accepted as valid under the Rules provided they satisfy other provisions for validity.

ART. 20A bis: Revise the last sentence after the clause (*h*) as follows: Note 1: The generic and specific names in works adopted as the starting points of nomenclature for the different groups of plants shall be treated as valid, even when they are unaccompanied by any description, an exception being made only of those names that are not correctly formed. Reference in such works to generic and specific descriptions published previously under the same name or another are invalid. For the purpose of typification, however, it is allowed to associate the Linnean genera in Species Plantarum (1753) and (1762–63) with their *first subsequent* descriptions in *Linnaeus's* Genera Plantarum (1754) and (1764), provided this does not disturb an already accepted typification based on any one of the specific components in 1753 and 1762–63 as the case may be. [Discussions 19–21 and 25].

ART. 25A bis: READ "admissible" for "valid" in the sentence: "But no generic name is valid unless:"

ART. 27A bis: READ "admissible" for "valid" in the sentence: "But no specific epithet is valid unless:"

ART. 28A bis: OMIT the words "of wild plants" in the first line of the second paragraph (Discussions 13 and 14).

REVISE the last two sentences in second paragraph thus: "The use of a binomial nomenclature for subordinate groups of a species is not admissible, nor is it permissible to reduce more complicated names to trinomials except by removing subspecific epithets, and the conventional epithets used to denote a group sensu stricto. In the case of the names of forma and subforma, the epithets denoting subspecies may not be omitted.

DELETE the examples of *Saxifraga Aizoon* subforma *surculosa* as it is misleading. [Discussions 4, 5, 7, 10 and 11].

ADD: "NOTE 1: Binomials published before 1905 as varietal names shall have a valid status only as ternary names obtained by linking the varietal (second) epithet to the

specific name under which the variety is established; the varietal binomials themselves, being invalid, are no obstacles to the priorability of their specific homonyms.

Examples: *Petroselinum sativum* Hoffm. var. *P. crispum* (Mill.) Nym., Consp. Fl. Eur. (1879) 309 shall be considered as having been published as *P. sativum* var. *crispum* (Mill.) Nym. GANDOGER's varietal binomials must be considered as having been published as ternary varietal names. As binomials they shall have no standing under the Rules.

[The rejection of varietal names published under the old system does not contribute to the clarity of the subject. No confusion would result if priority were allowed to these varietal epithets within their superior group. Discussions 7–9, 11 and 13].

ART. 28B bis: REVISE the first sentence: "No varietal or subvarietal epithet having a valid status shall denote the species sensu stricto (i.e. the taxonomic form represented by the type specimen)."

READ: **"NOTE 1"** for "Note" and at the end of the Note ADD: (*see* Rec. XXXV).

ADD: "**NOTE 2:** Two subordinate groups of the same species may not bear the same epithet in the same position. No subdivisionary or disjunctive group may bear the epithet of its immediately superior group, unless it includes the type of its immediately superior group. This rule also applies even when the epithets are preceded by such conventional prefixes as *Eu.*

Examples: TRANSFER here the examples under Art. 30 but amend the wording of the second example as follows:

"The following is incorrect: *Erysimum hieraciifolium* subsp. *strictum* var. *longisiliquum* and *E. hieraciifolium* subsp. *pannonicum* var. *longisiliquum;* the subspecific epithets being omissible, the varietal names are homonymous (*see* Art. 37Abis-5).

ADD: The expression *Andropogon Sorghum* subsp. *Sorghum* or *A. Sorghum* var. *Sorghum* is permissible (as a practical device) to denote only the type form of *A. Sorghum.* [Discussions 5–7, 9 and 11].

ART. 29: DELETE [This is self-evident because no homonymy is created].

REC. XIXB: Botanists are advised to follow the horticultural rules when dealing with cultural and hybrid forms which cannot be segregated taxonomically.

ARTS. 31–35: TRANSFER to Appendix VII. [Discussions 13 and 14].

SECTION 5A: REVISE: "Conditions of Valid Publication of Literature."

ART. 36A bis: Subject to Art. 20A bis, literature shall be valid only if it is printed or indelibly autographed and made available to the botanical public by sale, exchange, or distribution.

NOTE 1: From 1950 no publication shall be valid unless one hundred (100) copies at least are made available to the botanical public by sale, exchange, and/or distribution.

NOTE 2: Publication by issue of separates is not valid unless their distribution satisfies the general conditions for valid publication (see Note 1).

NOTE 3: From 1950 no systematic papers issued in non-botanical works or periodicals shall be valid unless they are also available to the botanical public in the form of separates.

NOTE 4: From 1950 seed-lists, indexes, herbarium labels, nomenclators, garden catalogues, floras for schools and colleges, plant introduction lists, and journals and books dealing with economic botany, shall be deemed as non-botanical works or periodicals for the purpose of this rule.

NOTE 5: The botanical public means institutions and botanists interested in systematic botany.

[The use of different terminology in different Articles to mean the same thing is often confusing. The present revision conforms with the terminology in Arts. 20A and 37A. See also remarks under Art. 36A in 1939 and Discussion 27].

RECOMMENDATION XXB: Botanists are advised to publish new nomenclatural entities in botanical monographs or periodicals, and are further recommended to indicate by means of special signs and types all new nomenclatural entities in the index or in an abstract accompanying the paper.

SECTION 6A: DELETE: "and dates" from the title of this Section.

[Rules concerning dates are put together with priorability in Section 9].

ART. 37A bis: AMEND (*b*): "by reference to a previously published valid description of a co-ordinate group (Note 4).

NOTE 2 bis: REVISE: The indication of the type locality, the peculiar habitat, or parentage or ancestry of a taxonomic group shall not be sufficient to establish a name under this rule. If descriptive characters are given, the type locality or the habit indicated shall become a part of the description and so shall form an

important element in determining the identity of the taxonomic group. However, economic uses, vernacular names, parentage or phylogeny (individually or together) shall not become a part of the description of the new entity, even when this entity be of cultural or hybrid origin.

[Characters mentioned in the last category are not observed in the field. Often information given by guides is erroneous, as also speculation regarding parentage, phylogeny or ancestry].

NOTE 4 (b) bis: REVISE: "For the purpose of this rule, the members in each of the following groups shall be considered as being co-ordinate:

(i) Divisio and its subdivisions; (ii) Class and its subdivisions; (iii) Order and its subdivisions; (iv) Family and its subdivisions; (v) Genus and its subdivisions; (vi) Species and Subspecies; (vii) Variety and subvarieties within the same species and (viii) Formæ and Subformæ within their immediate superior group.

ART. 37A bis: NOTE 4 (c) bis: REVISE: In the case of a new monotypic genus, *reference* shall be allowed to the generic description in validating the name of its species, it being also permitted to give the description of the genus under the binomial of the species (*descriptio generico-specifica*).

ADD: **NOTE 4 (d):** In validating the name of a variety, subvariety, forma or subforma, reference shall be allowed to the description of any species or subspecies, but the converse shall not be allowed. Reference to the description of a variety and other subordinate groups shall not be allowed to validate a subordinate group of equal or lower rank outside the species, except when this species or its subspecies is the isonym or the basinym of the one under which the varietal or infravarietal epithets are to be instated or were instated.

[Disjunctive groups being subordinate deviations from the standard receiving a superior name, are not easily fitted in as similar deviations of another standard unless defined again. Furthermore, varietal and specific differences are not co-ordinate.—See Discussions 4, 5, 8, 9 and 10].

Example: (1) *Glossopetalum pungens* Brandg. var. *glabra* (Ensign) H. St. John in Proc. Biol. Soc. Wash. LV (1942) is valid because the basinym of the variety was instated under *Forsellesia pungens* (Brandg.) Heller which is an isonym of *G. pungens* Brandg., the basinym of the variety being *F. pungens* var. *glabra* Ensign in Amer. Midl. Nat. XXVII (1942) 503.

(2) *Hemigramma Zollingeri* var. *major* Christ in Philipp. Journ. Sc. II (1907) 170 shall not be considered as the isonym of *Hemionitis gymnopteroides* forma *major* Copel., though the latter was considered as the basinym. The protologue of the variety therefore is the description and the syntype cited by CHRIST. See also examples under Notes 6 and 8 under Art. 51A.

ART. 37A bis: NOTE 4 (e): *Reference* to a description a defect of which rendered its name invalid shall not be able to validate the same or another name; for such a name to be valid a new description must be given.

Example 1: The names, *Neurotecoma* Schum. and *Spirotecoma* Baill., were invalid when published, the former because it was provisional and the latter because it was undescribed. DALLA TORRE et HARMS (1905) considered both these names as valid and listed the former in the synonymy of the latter which was earlier; this listing shall not be taken as the valid publication of *Spirotecoma* by reference to *Neurotecoma*, since the description of the latter was so defective as to render it invalid. [For discussion of this case see Furtado Provisional Names, in Gard. Bull. Straits Settl. IX, 1937, pp. 230–232; Discussion 25].

Example 2: *Leopoldia* was proposed as a provisional name by HERBERT in Bot. Mag. (1820) t. 2113, p. 5 footnote, to be adopted should certain circumstances prove true. The name did not become valid when it was mentioned in a letter in Trans. Hort. Soc. London IV (1821) 181 indicating that the plants of the group required certain cultural conditions.

[It is also invalid under the existing rule 37A (3) = Art. 42 (2) which interdicts references to the description *under the same name.* See Discussion 25].

NOTE 4 (f): No *reference* to a misapplication or misinterpretation of a name shall validate a name, even when there is available under the misapplied name a lengthy description based in part at least on new specimens. [Discussion 18].

NOTE 5 (a): TRANSFER here Art. 40A and ADD: "However names of subspecies published before 1930 shall be a special case of alternative names where the isonyms and the basinyms are of unequal rank; they shall be the names of subdivisions (= subspecies) of a species sensu amplissimo and at the same time specific names of the microspecific groups. [Discussion 7].

NOTE 5 (b): Where Note 5 (*a*) applies, the alternative specific binomial for the subspecies shall be obtained by omitting the intercalating epithet between the generic name and the subspecific epithet; and if published as a specific binomial, the alternative subspecific trinomial shall be obtained by joining the epithet denoting the subspecies to the binomial denoting the metrospecies.

NOTE 5 (c): Where Note 5 (*a*) applies, the varieties and other subordinate groups published under a subspecies shall become ipso facto varieties and subvarieties under the alternative specific name.

NOTE 5 (d): Since in all cases the intercalating epithets denoting the subdivisionary groups may be omitted, the varieties and subvarieties instated under a subspecies shall also be varieties and subvarieties under the species sensu amplissimo. This does not apply to formæ and subformæ which remain under the special group in which they are instated, the epithet var. *typica* or its equivalent being omissible.
[cf. Discussions 4–7, 10 and 11].

NOTE 6: TRANSFER here Art. 40B.

NOTE 7: TRANSFER here Art. 41A.

ART. 45A: DELETE: it is transferred to Art. 52C in Section 9.

ART. 49A: REVISE: "When a name or epithet of a taxonomic group is retained after transferring it to a new position or rank, the name of the original author must be cited in parenthesis, followed by the name of the author who effected the transference, provided such a transference is allowed (see Art. 37A bis). If the transfer is not allowed, the instatement of the name or epithet in the new position or rank shall be invalid unless accompanied by a new description; in the latter case, the author who supplied the new description shall be cited.

[Reasons have already been adduced for limiting the references permissible in Art. 37A bis. Hence the amendment is needed here also. In addition, some verbal alterations were needed since "or a group of lower rank" at the beginning of Art. 49 could have been interpreted to render a part of the second sentence unnecessary or superfluous. The amendment also takes into consideration that the priorability is limited in the case of names of subdivisionary and disjunctive classes. See Discussions 6, 7, 8, 9 and 13–14].

SECTION 8A: ADD "Typification and" *before* the existing title.

ART. 50B bis: REVISE: "The type of the name of an Order or Suborder is a Family, that of the name of a Family, Tribe or Subtribe is a Genus, and that of the name of a Genus, a Species, or a group of lower rank, is usually a specimen or preparation. Where a new species includes the type-specimen of a simultaneously published genus, the type of the genus, and the type of the species shall be identical; the name of the species shall

then be retained to the generic type. Where the name of the species that includes the type of a new genus is an isonym of a previous name, the type of the new genus and the type of the isonym may not be identical; and so the genus may be so split as not to retain the specific isonym under it. Where permanent preservation of a specimen or preparation is impossible, the application of the name of a genus and other subordinate groups is determined by means of an original description or figure.

NOTE 1: No name may be used for a supra-generic group if it is taken from the name of a genus not retained under the group even as a synonym.

[This combines the second part of Art. 18, and Art. 66. Other changes were required because in many cases the so-called "type" species is not the type of the genus. cf. also Discussions 17 and 18].

Examples: TRANSFER here the example under Art. 18, but DELETE "and description" in the third line. TRANSFER here also the examples from Art. 66. [Discussions 19–21, and Art. 20A].

REC. XXXIIB: TRANSFER here REC. IV after DELETING "the subdivision which is" in the first sentence and after ADDING "or type-specimen" after "type-species" and SUBSTITUTING the word "type" for "type-variety or" in the second line.

REC. XXXIIC: TRANSFER here REC. V after SUBSTITUTING "When subdividing or splitting a genus" for "When revising a genus", and ADDING "or specimen" after "species".

[The word "revise" is used in a different sense in taxonomy, and revisers do not usually have opportunities to indicate lectotypes. Except in splitting or subdividing a group, revisers should not attempt to select lectotypes for fear of misdirecting future investigations. Discussions 17–21].

REC. XXXIID: TRANSFER here Rec. VI [Discussion 3].

ART. 51A: REVISE: "When an author has included under one taxonomic group two or more different elements (a *mixtum compositum*) and no holotype has been indicated, the first subsequent author who recognises the mixed composition of the group and selects a lectotype on adequate botanical reasons (Art. 22B and Note 1 below), or transfers the discordant elements to another taxonomic group, shall be followed, provided the name is retained to one of the original elements (see Art. 20A bis Note 1 and Art. 50B bis). If the name has not been retained to any of the original

syntypes, it must be re-established to one of them. Where the holotype has been indicated even indirectly, the name must be retained to it except in cases indicated in the Notes below.

ART. 51A: NOTE 1: If two or more interpretations are possible, and if no syntypes are available, or when available are inadequate for the correct interpretation of the taxonomic group (a negative *mixtum compositum*), the neotype shall be so selected as to defend the earliest interpretation that agrees with the general plant-geographical and descriptive considerations and keeps the major group in the position assigned by the author (see Art. 22B).

Example: TRANSFER here examples from Arts. 51 and 52, and ADD:

Rhus filicina DC (1825) was based on two unpublished drawings (Ic. 189 and 217) and on two manuscript species based on these drawings (*R. filicina* and *R. Tetlaziam*), both of which were regarded by DE CANDOLLE as conspecific. The manuscript species and the drawings were all by SESSE and MOCINO. About 50 years later, Ic. no. 189 was printed and published as being the type of *R. filicina*. This drawing is not well made and appears to be of a plant with bi- and tri-pinnate leaves. On this character the species has been regarded as conspecific with *Amyris bipinnata* Sesse et Mocino, Ic. 197 ex DC. (1825) (the basinym of *Bursera bipinnata* (DC.) Engl., 1881), the implication being that DE CANDOLLE had made a mistake in describing the leaves. Others, however, disagree with this reduction and suppose that the leaf characters may have been badly drawn by DE CANDOLLE's artist, who had to copy hurriedly from SESSE and MOCINO's original drawings. These maintain that the clear description of the leaves and of the fruits admit no doubt as to its identity as a species of *Rhus* as understood by DE CANDOLLE, and not *Bursera bipinnata*. (For controversy cf. Barkley in Ann. Missouri Bot. Gard. XXIV, 1937, pp. 1–10 et 3 pl; Barkley and Reed in Amer. Midl. Nat. XXI, 1939, pp. 368–377; Bullock in Kew Bull. 1937, pp. 440–441 and 1939, pp. 337–339).

In Ic. 189 no fruit is represented, and flowers are too poor for any generic identification. The facts that DE CANDOLLE described the fruit of the species, mentioned the vernacular name *Tetlaziam*, and stated that the species has simple imparipinnate leaves with pinnatifid sessile leaflets, lead one to typify *R. filicina* D.C. (1825) on the second syntype, namely, *R. Tetlaziam* Sesse et Mocino msc Ic. 217 (ined); for this syntype agrees well with all the characters mentioned by DE CANDOLLE, and it is also the one that has a fruit. Hence this syntype must be the lectotype of *R. filicina* (Barkley has indicated a neotype cf. example 3 under Note 3 below).

[*N.B.* Those who typify the species on Ic. 189, alleging that the species was based "primarily" on Ic. 189, and not Ic. 217, overlook the fact that *R. filicina* as published in 1825 was not *R. filicina* Sesse et Mocino *in* vel *apud* DC., but *R. filicina* Sesse et Mocino *ex* DC., the latter expression being equivalent to *R. filicina* DC. Hence in typifying the species,

DE CANDOLLE's syntypes, and not SESSE and MOCINO's holotype, should be considered. In 1874 only Ic. 189 was published, apparently because it was the type of the manuscript name, but unfortunately it is the syntype that has to be excluded from the mixtum compositum. This is a good instance of a misdirection of studies by publishing in 1874 only one drawing (instead of two) as the type of *R. filicina*, and justifies my protest "against unnecessary alterations being made in the status of the syntypes even when the changes made are by the author of the species himself." (Gard. Bull. Straits Settl. IX, 1937, pp. 296–299)].

ART. 51A: NOTE 2: Notes left by the author on herbarium sheets shall not be used to discredit a typification previously made. Such notes, however, may be employed to supplement the published data and in selecting a lectotype if none has been previously indicated (either directly or indirectly). This lectotype may be chosen only when the current interpretation is not clear and does not accord with the general plant-geographical and descriptive considerations. [cf. Discussions 20–21].

NOTE 3: If a new genus is based on new specimens but an old species has been indicated as the type, and if it is found that the indicated type species is generically or specifically different from the new type specimens studied, the new genus shall then be typified on the new specimens on which the generic description was based [Discussion 17].

Example 1: The genus *Binghamia* Britt. et Rose in Cactaceae II (1920) 167 was created to receive two old species, *Cephalocereus melanostele* Vaupel (1913) and *Cereus acranthus* Vaupel (1913). The two isonyms instated under the new genus were *B. melanostele* and *B. acrantha*, the former being indicated as the type species of the new genus. But, as pointed out by BULLOCK in Kew Bull. (1938) 454–458, there is no evidence that the authors actually saw the type of the species indicated as the type of the genus; and it is evident that the genus was based on newer material which, because of the similarity of habit and also because of its occurrence in the type-locality, was mistaken for *C. melanostele* Vaupel. The latter, being a species of *Espostoa* Britt. et Rose in Cactaceae II (1920) 60, has yielded the new isonym *E. melanostele* (Vaupel) Bullock (1938). But, despite this transference of the indicated type species of *Binghamia*, the latter genus does not become a synonym of *Espostoa;* for *Binghamia* is to be typified on the actual material on which the generic description was based, though mistaken for *C. melanostele*. This material has been shown to be conspecific with *Cereus* (Sect. *Binghamia*) *pseudo-melanostele* Wedermann et Blackeberg in Neue Kakteen (1931) 74–75 (quoted by Bullock), and so the new combination has been rightly instated by BULLOCK as *Binghamia pseudomelanostele* (Wederm. et Blackeb.) Bullock (1938). The type specimens of this species and those of the genus, though conspecific, are not identical.

Example 2: In instating *Goniophlebium* Presl (1836), an original generic description was given, and two out of the five species were figured. These two species (the only ones seen by Presl) were from America. PRESL also cited under the genus, *Polypodium* sect. *Goniophlebium* Bl. (1830); but all three of BLUME's species were cited with some doubt, and with the following explanatory note: "Species Blumeanas non vidi et solummodo ex auctoritate clar. Blume huc retuli." The fact that PRESL referred all the syntypes of BLUME's section doubtfully to his genus is important because no genus can be typified on the species or specimens which have been referred doubtfully to it. PRESL was free to use any name for his genus, and the fact that he typified the genus on the specimens studied by him is an important point to bear in mind. Had he also included the specimens and the species of BLUME without expressing any doubt, the genus would have had to be typified as in the case of Example 1. But, as it is, the case is quite clear: the genus must be typified on the American syntypes studied and described by PRESL.

[In Genera Filicum (1947 p. 181) COPELAND writes that PRESL could not take the name from BLUME without also taking "whatever type of BLUME properly went with the name." Yet in discussing *Anapausia*, COPELAND (op. cit. p. 132) writes: "In general, when the status of a group is changed, as from a section to a genus, its type goes with it. But in this particular case, in publishing *Anapausia* as a genus, PRESL cited "*Gymnopteris* §2 *Anapausia* Presl (excl. speciebus)". So COPELAND does not accept the type of the Section as the type of the genus *Anapausia*. What is allowed in one case should also be allowed in the other].

Example 3: In establishing the monotypic genus *Actinocheita*, BARKLEY (Ann. Miss. Bot. Gard. XXIV, 1937, pp. 1–10 et 3 pl.) supposed that the *syntype* Ic. 189 of *Rhus filicina* DC. (1825) was somewhat misdrawn by the artist, but, because of the description of the leaves and the fruit, typified the species on *Pringle 4752* (a neotype). From this neotype BARKLEY drew the principal characters of the genus. Hence the genus must be typified on *Pringle 4752*, and the "type" species should include that specimen.

[BULLOCK in Kew Bull. (1937) 440–441 and (1939) 337–339 has advocated that the type of this genus should be *Rhus potentilifolia* Turcz with *Galeoti 4006A* as the type, and, therefore, he has made the new combination *A. potentilifolia* (Turcz.) Bullock. Against this BARKLEY (l.c.) and BARKLEY and REED (Amer. Midl. Nat. XXI (1939) 368–377, quoted by Bullock) have argued that the genus should be typified on *Rhus filicina* DC. with Ic. 189 as the type, suggesting that, if this type is not retained, the genus should receive another name. Hence the type species is called *A. filicina* (DC.) Barkley. But in the example discussed under the foregoing *Note 1*, it has been shown that *R. filicina* DC. should be typified on *Ic. 217*, the manuscript type of *R. Tetlaziam* Sesse et Mocino msc. Thus typified *R. filicina* DC. becomes conspecific with *Pringle 4752*. The correct name for the species that includes the type of *Actinocheita* is, therefore, *A. filicina* (DC.) Barkley *emend.* Furtado].

Example 4: *Hemigramma* Christ in Philipp. Journ. Sc. II (1907) was established as a monotypic genus with *H. Zollingeri* (Kurz) Christ (*Heminiotis Zollingeri* Kurz) as the species,

and with *H. Zollingeri* var. *major* (Copel.) Christ as a variety. CHRIST excluded from the genus *Leptochilus latifolius* (Meyen) Christ (*Gymnopteris taccaefolia* Sm. and *G. latifolia* Meyen). Now it is maintained that *G. latifolia* is identical with *H. Zollingeri* and that therefore the type species of *Hemigramma* should be *H. latifolia* (Meyen) Copel. (1907) (*G. latifolia* Meyen), that is, precisely the species that was explicitly excluded from the genus.

Actually the genus was described from new specimens studied by CHRIST, namely: (1) from "Batavia, Java, ex Herb. Hort. Bot. Bogor., and from Celebes, leg. Sarasin" with which KURZ's figure was compared, and (2) from the Philippines cited under the var. *major*. In typifying the genus all these specimens must be considered, and not only those cited under the variety, as has been suggested by COPELAND in Science LXIX (1939) 328. Under certain circumstances *H. latifolia* may be the legitimate (correct) name for the species that includes the lectotype of the genus, but the genus must not be typified on the type of this species (cf. also Copeland, Gen. Filicum, 1947, p. 131.).

ART. 51A: NOTE 4: In Fungi Caeteri all the genera and the species instated validly for the first time in FRIES's Systema Mycologicum (1821–32) shall be typified on the descriptions given, and the specimens and the figures cited or implied by FRIES, the discoverer of a mixtum compositum being free to choose any one of these as the lectotype. However, a genus or species validly instated for the first time by another author after the issue of the first part of Systema (1821), but taken up subsequently by FRIES in another part of his Systema shall be typified on the types and description given by the original author, disregarding the newer circumscriptions and types given by FRIES.

[This gives a definite guidance on a point where there is much confusion. In addition it safeguards the species and genera of PERSOON and other authors who published between the 1821–32 more accurate descriptions and figures than those given by FRIES. cf. also Discussions 19–21].

ART. 51A: NOTE 5: If in instating a new name there was cited an equivalent priorable synonym of which the new name may be taken as a new combination under Arts. 53A bis and 56A bis, then the new name shall be taken as the isonym of the cited synonym and typified accordingly, even though the instatement was accompanied by a new description and by an indication of a new holotype. If two or more synonyms have equal claim to be the basinym and no clue has been given by the author to discriminate between the rival claims, then the earliest of the synonyms shall be taken as the basinym. If the cited synonym was impriorable, the new name shall be typified (that is, when no holotype

has been indicated) on any of the syntypes; the lectotype thus chosen may or may not be the type of the cited synonym.

Example 1: In Example (*d*) under Art. 56A (1939), *Petunia minima* Reiche (1910) is a priorable isonym of *Nicotiana minima* Phil. (1864), non Molina (1782). Hence *Combera minima* Sandw. (1939) must be taken as a new combination of *P. minima* Reiche (1910), though SANDWITH regarded the former as a new name and had indicated a new type.

Example 2: *Cratoxylon formosum* Dyer (Fl. Brit. Ind. I, 1874, p. 258) was instated by a new description accompanied by the citation of two synonyms: *Elodea formosa* Jack (1822) and *Tridesmis formosa* Korth. (1839). These synonyms are not typonymous, and DYER did not indicate which of these two should be taken as the basinym of his name. Hence *E. formosa*, being earlier of the two, must be taken as the basinym of *C. formosum* Dyer, and the latter must be typified accordingly.

Example 3: Under *Ixora affinis* Don var. *arguta* Craib comb. nov. (1934) no descriptions was given, but the two following synonyms were cited: *I. arguta* King (1904) and *I. nigricans* Wight et Arn. var. *arguta* Hk. (1880). Since no varietal description can validate a species, or a variety outside its own species, and since a specific description can validate a variety (Art. 37Abis-4d), it is obvious that CRAIB's variety must be typified on the type of *I. arguta* King, and not on the variety cited in the synonyms. (See also the example in Note 8 below.

ART. 51A: NOTE 6: If a new combination has been based on a priorable synonym of equal rank against the priority rule (Art. 56A bis), this new combination shall still be typified on its basinym [Discussion 15–16].

Example 1: *Shorea costata* Presl., Rostlinei II (1825) 66 was published by citing *Pterigium costatum* Correa (1806) and *Dryobalanops aromatica* Gaert. f. (1805). Though *D. aromatica* Gaertn. f. was older and priorable, and PRESLEM had violated the rule of priority, *S. costata* Presl. must be typified on *P. costatum* Correa. Under Shorea, *S. costata* (Correa) Presl. must be used whenever the synonyms are regarded as taxonomically different.
[Symington states that the two synonyms are taxonomically different: Gard. Bull. Straits Settl. X (1939) 368–369 in Observ. sub *Shorea submontana*].

ART. 51A: NOTE 7: If a synonym that appears like a basinym is merely an expression to denote its misapplication, then the new name shall be typified on the new description and its syntypes; if no such new description was made available under the new name, the question of typification does not arise, since the new name is invalid (Art. 37A bis. Note 4–f).

Example 1: See the discussion of *Goniophlebium* Presl. in Note 3, Example 3.

Example 2: *Heleocharis capitata* R. Br. (1810) was based on a new description and citation of a misapplication of *Scirpus capitatus* L. *sensu* Willd., with a clear indication that the types of the latter species were excluded. Hence the species must be typified on the description and the syntypes given by R. BROWN, and not on the types of *Scirpus capitatus L.* [Much confusion has been caused by typifying *H. capitata* R. Br. on *S. capitatus* L. For fuller details see Furtado in Gard. Bull. Straits Settl. IX, 1937, pp. 293–294].

ART. 51A: NOTE 8: If a name is intended to be a new combination based on a synonym not admissible under Art. 37A bis, the name shall be typified on the new description and its syntypes; if no such new description was given under the name, the question of typification does not arise, since the name cannot be valid.

Example 1: *Ixora arguta* King in Journ. Asiat. Soc. Bengal LXXII (1904) 74 was instated by a description, accompanied by a citation, in the synonyms, of *L. nigricans* R. Br. var. *arguta* Hk. f. (1889). Since under Art. 37A bis-4(*d*), a varietal description cannot be cited to establish a species, *I. arguta* King must be typified on the types indicated by KING, and not by HOOKER.

[In Gard. Bull. Straits Settl. IX (1937) 294–296, I gave a different typification, since the Rules admit references to a varietal description in validating a species. Amendments have now been proposed to prohibit this procedure, as it causes serious complications in plant taxonomy and nomenclature. *See* Discussions 8, 13 and 14].

Example 2: *Hoya esculenta* (Rumphius) Tsiang comb. nov. in Sunyatsenia III (1936) 176 was instated by citing *Sussuela esculentum* Rumph. Herb. Amb. V (1747) 467 t/175 f. 2 (an invalid name with non-validable description—*see* Art. 20A), *Hoya diversifolia* Bl. (1826) and *H. orbiculata* Wight (1832), the last two being priorable synonyms. The epithet in the invalid synonym has been used in the mistaken belief that it had the right to priority; but since its description cannot validate *H. esculentum*, this new binomial must be regarded as invalid. (cf. Example in Note 9).

ART. 51A: NOTE 9: If a new name (nomen novum) has been instated by citation of a valid synonym, and by a new description, and no holotype has been indicated, all the syntypes of the description shall be included in the typification of the new name. If no new description was given, then the isonym shall be typified on the basinym.

Example 1: *Anodendron manubriatum* (Wall.) Merr. comb. nov. in Philipp. Journ. Sci. VII (1912) 333 was created by citing the following synonyms:

Echites manubriata Wall. Cat. (1829) n. 1663 (a nomen nudum).

E. paniculata Roxb. (1832) (a later homonym of *E. paniculata* Poir).

E. coriacea Wall. Cat. n. 4464 (a misinterpretation of *E. coriacea* Bl).

A. paniculata (Roxb.) DC. (1884) (a priorable name). No new description was given. The epithet *manubriata* was adopted for the new name on the mistaken belief that *A. paniculata* DC. was impriorable and that the Wallichian combination supplied the earliest epithet "that is tenable, although originally a *nomen nudum*." Since MERRILL intended *A. manubriatum* to be a new name for *A. paniculata* (Roxb.) DC., which he considered mistakenly to be impriorable, MERRILL's new name should be valid with reference to the description of *A. paniculata*. (*E. manubriata* was clearly recognized as a nomen nudum unable to validate the new combination. WALLICH had intended it to be a new name for *E. paniculata* Roxb., but unfortunately the publication of the latter was delayed and rendered the former name invalid).

ART. 51A: NOTE 10: If a specific name has been instated as a "new combination" with the generic name of the basinym as the specific epithet in the combination, the new name, though unsatisfactory under the priority rule, shall be typified on the basinym, disregarding the new description and new types.

Examples: *Artocarpus polyphemia* Pers. (1807) was based on *Polyphemia Champeden* Lour. (1790) and a description; the former, which was a legitimate isonym under the old custom, must be typified on the type of the latter (basinym). (It should not be possible to typify this isonym differently so as to permit its being considered not synonymous with *Artocarpus Champeden*).

ART. 52: DELETE. Incorporated with Art. 51A.

SECTION 9A bis: REVISE "Dates, Priorability and Legitimacy of Names".

ART. 52B: TRANSFER here Art. 61B Note 2; and ADD:

NOTE 1: All valid names of the necessary groups of the same rank must be included in priority considerations, subject to the Notes below and to Arts. 52D–F.

NOTE 2: Conserved names or nomina praecedenda take precedence over all other names for the groups for which they are conserved, even when they are later homonyms or later synonyms, provided the conservation is made explicitly for the purpose (Arts. 21B–D).

NOTE 3: When the starting point of nomenclature for a group of plants is a book issued in parts at different dates, and when, in the intervening periods, names have been validly published in another book, or periodical, these latter names, unless taken up in the starting point book, shall yield their precedence both in priorability and homonymy to the names published in the book fixed as the starting point. [cf. also Art. 51A Note 4].

NOTE 4: Specific epithets instated under a valid but imppriorable genus are priorable in the same way as those established under a priorable genus. [Discussions 23 and 24].

NOTE 5: The priorability of the names of Fungi with pleomorphic life-cycle is guided by Art. 57 which prescribes that only the names given to the perfect state are to be admitted in priority considerations, the generic name including at least one specific name for a perfect form being also eligible for inclusion in priority considerations. The names of other states are only of temporary value, and cannot claim priority over the names of perfect groups.

NOTE 6: The priorability of the names of *subdivisionary* and *disjunctive* groups is restricted as follows:—

(*a*) Priorability of names or epithets denoting varieties and infra-varietal groups shall be restricted within their immediately superior group. When however a specific or subspecific name has become the basinym of a new name for the group, names of the subordinate groups under the basinym shall have priority claim under the isonym also, and conversely the names of the subordinate groups under the isonym shall claim priority right under the basinym. [Discussions 4–10].

(*b*) The priorability of the epithets of groups of the *subdivisionary* class shall be restricted within the same *necessary* group and under the same name, and this also when the basis of the classification is the same. If the name of the necessary group is the basinym or isonym of another name, then the subdivisionary epithets will have a priority claim under both the basinym and isonym of the necessary group, provided the basis of the classification is the same.

Rec. XXXIIB: Whenever a genus or its subdivision is transferred as a subdivision to another genus, botanists are advised, when possible, to retain, for the subdivision, the generic or subdivisional epithet, provided no priorable epithet is already available for it in the new position. [This is the old Art. 53].

ART. 52C: TRANSFER here Art. 45A and insert at the end of the first sentence, the second line, before the full-stop, "or in some cases from its earliest valid transfer (Note 1)".

NOTE 1: The priorability of names and epithets of organisms transferred from the animal to the vegetable

kingdom, shall date from their earliest valid instatement in the vegetable kingdom. Mere citation of the names in the synonymy of botanical names shall not constitute a valid instatement under this rule.

[This is the natural consequence of Art. 36A bis; botanists should not be bound to refer to the works of zoologists, who are ruled by a different code of rules].

ART. 52D: TRANSFER here Art. 61A and Note 1, but DELETE Note 2 and "or its formal equivalent" in Art. 61A; and ADD:

"**NOTE 2:** Later and simultaneous homonyms discarded under this rule are impriorable."

[This Note 2 is Art. 61B. This amendment and those in Art. 61A (Art. 52D) are made in view of the proposed changes in Arts. 28A bis and in the limitation of priority in the names of non-necessary groups].

NOTE 3: TRANSFER here Art. 61B Note 1, after OMITTING "real (not formal)" from the first sentence.

ART. 52E: TRANSFER here Art. 62A, but DELETE "or legitimized".

ART. 52F: TRANSFER here Art. 63A, but DELETE the phrase "nor be legitimized", and substitute "not" for "neither".

ART. 53A bis: READ "adopted" for "legitimized" in the second paragraph, second line.

NOTE 2: TRANSFER here Art. 53B.

SECTION 10: DELETE the title. The Articles go with Section 9A bis.

ART. 56A bis: READ "adopt" and "adopted" for "legitimize" and "legitimized" respectively.

SECTION 11 and **ART. 58:** DELETE. [This confuses the rule of priority, which is applied to names of the same rank. This Article is also irrelevant. Art. 37A bis and 52B-C clarify the issue].

Rec. XXXVIA: READ "unless it becomes impriorable" for "unless it is rejected under Section 12". But DELETE Rec. XXXVI (3), as this confuses the typification. [Discussions 9, 13–14 and 25, and Art. 37A bis].

SECTION 12 and **ARTS. 59–69:** DELETE.

[Relevant matter has already been incorporated in Arts. 52B-F. These Articles are wrongly placed here, and much of the material is confusing. See Discussions 15 and 16].

ART. 70A: ADD to the first sentence in the second line before the full-stop "Or of a change made in the original spelling of the names and epithets in order to conform with the prescriptions and recommendations regarding gender, transcription, or termination".

NOTE 4A: REVISE: (*a*) Generic names of Greek origin differing merely by Greek and Latin terminations respectively, but involving no change in gender or other grammatical accidence of words are orthographic variants or homonyms; where change in terminations indicates a difference in gender or other accidence, the generic names must be considered as different (not homonymous).

(*b*) Orthographic variants may also be formed by a slight difference in spelling adopted for the sake of correct Latin form, correct etymology, or euphony in transliterating or transcribing a foreign word in Latin (without the change of gender or case), or by a decision of the Congress (Art. 21B). Different generic names made by slightly altering the spelling of the same word of foreign origin must be submitted for the decision of the Congress if they are likely to be confused as homonyms or orthographic variants.

(*c*) Specific and other epithets differing slightly in form and having the same meaning, or differing only in Greek and Latin terminations are considered as orthographic variants or homonyms, even when these terminations indicate a difference in gender or case, or sometimes in others accidence also; the proper noun in any inflection and the adjectives derived from it are however different epithets e.g. (*Lysimachia*) *Hemsleyana* and *L. Hemsleyi.*

(*d*) Changes made in the original spelling of specific and other epithets in order to conform with prescriptions and recommendations in regard to gender, transcription and termination do not constitute different epithets.

Examples: ADD (*a*) Different Generic Names: *Anodendron* and *Anadendron; Boea* and *Bouea; Gyrinops* and *Gyrinopsis.*

(*b*) Orthographic variants: Generic names: *Bulbophyllum* and *Bulbophyllon; Anadendron* and *Anadendrum; Dysoxylon* and *Dysoxylum: Eleocharis* and *Heleocharis; Bambos* and *Bambusa; Houmiri* and *Humiria; Swertia* and *Sweertia; Sesban* and *Sesbanea; Dictyosperma* and *Dictyospermum.*

(*c*) Orthographic variants and homonyms: (1) *Andreoskia* Reichb. apud Spach is a later homonym of *Andreoskia* DC. and an orthographic variant of *Andrzeiowskia* Reichb.;

(2) *Beureria* Spreng. is a later homonym of *Beureria* Ehret. and orthographic variant of *Bourreria* P. Br. and of *Beurreria* Spreng.; (3) *Schultzia* Spreng. a later homonym of *Schultzia* Rafin. and an orthographic variant of *Schultzia* Spreng.; (4) *Silvaea* Meissn. a later homonym of *Silvaea* Hook. et Arn. and an orthographic variant of *Silvia* Allem.; (5) *Wendtia* DC. an earlier homonym of *Wendtia* Meyen and an orthographic variant of *Wendia* Hoffm.; (6) *Dictyosperma* Wendl. et Dr. is a later homonym of *Dictyospermum* Wight and *Dyctisperma* Raf. and an orthographic variant of *Dictyospermum* Wendl. et Dr.

(*d*) Orthographic variants: epithets: *integer-ra-grum; Kunstleri, Kunstlerii* and *Kuenstleri; sandwicensis-e* and *sandwichensis-e.* [Discussions 28 and 29].

ART. 72B bis: SUBSTITUTE "subordinate groups" for "subdivisions".

[This change is needed in order to conform with the restrictions made in the use of the term subdivision. Cf. Discussions 5–12].

PALMAE MALESICAE—X

The Malayan species of Salacca.

By C. X. FURTADO,
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This genus of palms has usually been known by the name Zalacca, but in fact the earliest valid publication of the generic name is spelled Salacca by Reinwardt. The spelling Zalacca (copied from the Herbarium Amboinense) was adopted soon afterwards by Blume and has since been current. A discussion on the matter is given below under *S. edulis*. The genus belongs to the class *Lepidocaryeae*, so-called because the fruit in this class of palms has its outer coat made of small scales. In its structure, *Salacca* may be considered to represent a more primitive stage in the evolution of *Lepidocaryeae* than the species of *Calamus*, *Daemonorops* and allied genera.

The Salaccas are all apparently stemless or short-stemmed palms, usually tufted, producing very long leaves, (in one species small), bearing spines on leaf-stalks, and setae or spinules on the margins and sometimes on the veins of the leaflets. Each clump is produced by successive branchings near the base. The buds which produce the branches may begin growth in the axils of living leaves, or in the axils of leaves which have fallen. In the latter case, the branches are, so far as observed, always vegetative. In the former case, the developing bud pierces through the base of the leaf-sheath; and the branch may bear only a tuft of leaves, or only flowers, or it may bear both flowers and leaves. A branch which bears both flowers and leaves (the latter always terminal) may continue to produce flowers even after the leaves have begun to develop.

Each branch grows horizontally or obliquely upwards for a certain distance (this distance depending on the species) before producing its terminal erect tuft of leaves; the part below the leaves is covered with sheaths. The form of the whole clump is determined by the mode of growth and length of these branches.

The way in which the spadices arise in Salacca by puncturing the back of the leaf-sheath at its very base is markedly different from their origin in the allied Malayan genera, and especially from the species of *Calamus* and *Daemonorops* which have their spadices connate with the axillary internode and with the leaf-sheath above the

internode, so that a spadix in these latter two genera appears to arise externally from the sheath of the leaf above the axillant leaf.

Though the leaves of Salacca are very spiny, no claws or spines of any kind are found in any parts of the Salacca inflorescence, except on the outermost spathes of *S. conferta.* The fruits are always scaly, and sometimes the scales are pungent; and all such fruit scales may themselves be regarded as a transformation of spines. The spadix bears cylindrical spikes either directly on the main axis, or on primary, secondary, or tertiary branches. In some species these spikes are distant, in others they are close together; in a few species the spadices are as much as one to two metres long, whereas in some the spadix may be as short as 20 cm. Each spadix-branch arises in the axil of a spathe, but subsequent development may be such as to make the branch or spike appear much above the axillant spathe. A female spadix is somewhat dissimilar from the corresponding male spadix, and, though it is often shorter than the latter, it bears usually larger spikes. All the primary spathes are more or less coriaceous, loose, tubular at first, later open on one side to a greater part of their length, and in some species quite lacerate in the limb. The secondary and other spathes are similar but smaller, tending to be less firm, or almost chartaceous; sometimes there may be more than one spathe on the stalk that bears the spike.

The spike, which arises in the axil of a spathe, is composed of many approximate bracts (corresponding to the spathels of Calamus) which are more or less united at their margins. Within these bracts there are bracteoles which form an epicalyx to each flower.

The *male flowers* arise in a pair in the axil of each spathel (bract), each flower having a bracteole as the epicalyx. The calyx is membranous, 3–parted; the corolla is longer than the calyx, having a tubular base, fleshy at the very bottom, and a 3–partite limb. There are six epipetalous stamens; and the ovary is abortive.

The *female flowers* are either solitary in the axil of a bract (in *Leio-Salacca*), or each is accompanied by a neuter flower (*Eu-Salacca* and *Eleiodoxa*); but each female flower has an epicalyx formed of two bracteoles, while the epicalyx of the neuter flower, like that of the male flower, consists of only one bracteole. The calyx is membranous, 3–parted; the corolla nearly as long as, or slightly longer than, the calyx, valvately 3–partite; the staminodes six; the ovary 3–celled, strigose (*Eu-Salacca*), or not (*Leio-Salacca* and *Eleiodoxa*). The fruit is 1–3–celled, having either smooth adpressed scales (*Leio-Salacca* and *Eleiodoxa*), or specially

elongated sharp, upturned tips to the scales (*Eu-Salacca*). The seed is surrounded with a soft, somewhat acid edible integument; the endosperm is homogeneous with a deep cavity at its apex; the embryo is situated at the base, exactly opposite the apical cavity, or slightly above the base on one side.

In their general characters, the species of *Salacca* may be grouped into three classes as shewn in the previous paragraph; but the differences between these classes are such that systematists in general are not yet agreed whether the classes should receive the rank of sections, subgenera or genera; but considering that the species involved are not many, that the vegetative characters do not vary very much, and that the distinctions in the important reproductive parts are not clear-cut, I have found it expedient to keep these classes only as sections, and to adopt for them BECCARI's names, proposed originally both as sectional and as alternative subgeneric names.

Distribution.

The genus Salacca is distributed throughout the Indo-Malaysian region from Assam, Burma, Siam, Indo-China, Malaya, Sumatra, Borneo, Java and the Philippines. A form with much edible flesh has been supposed to be native in Amboina, but RUMPHIUS is quite positive that this was introduced into Amboina from Bali and Banda Islands, and there is no other evidence of the genus occurring wild from Celebes eastwards.

Nomenclature

Since *Zalacca* and *Salacca* are not two homonyms but different spellings of the same name (orthographic variants), combinations instated under the erroneously spelt generic name should be considered as having been instated also under the correctly spelt generic one; and on this view I have considered all the specific names originally published under *Zalacca* as validly published also under *Salacca*. To consider all those binomials which have been corrected here for the first time as to the spelling of the generic name as new combinations formed by me would be misleading.

[MILNE-REDHEAD (Kew Bull., 1948, p. 170) has considered *Fernandia Ferdinandi* (Welw.) Schum. (1903) and *Fernandoa Ferdinandi* (Welw.) Milne-Redhead (1948) as two different combinations, when *Fernandia* and *Fernandoa* are two different spellings of the same name; but such a procedure, in my opinion, is incorrect. Were *Fernandoa* a different name from *Fernandia*, then it would

not be possible to replace the earlier name *Fernandia* by a later name, *Fernandoa,* unless it were formally proposed for conservation; the replacement has been justified on the plea that the two names were orthographic variants and that the earlier was a wrong spelling of the later].

In the treatment given below, therefore, I have retained the name of the original author who made the binomial combination under the wrongly spelt generic name, though I have corrected the generic spelling. However, I have inserted *Z* or *Zalacca* in brackets after *Salacca* in order to show that the original combination was made under *Zalacca*

Apart from this difference in spelling, there has been a good deal of confusion in the use of specific names established early in the genus. This is due mainly to the desire of later botanists to identify the "lost plants" described by 17th century writers. Hence, when establishing the genus or its species, these botanists sometimes quoted the pre–1753 writers who had described or depicted plants believed to belong to the species the later botanists were studying. But in fact the genus and its species were established by these later botanists, not by 17th century authors, so that in interpreting the genus or species, more importance should be attached to the specimens studied by the authors than to the doubtful figures quoted by them. Thus *S. edulis* was established on definite specimens studied by REINWARDT, on which the generic description was also based. This type material, a drawing of which was later made available to MARTIUS, should not be over-looked merely because REINWARDT had referred also to the previous writers who had described Salacca fruits imported to Europe preserved in brine, and to RUMPHIUS who, in addition to making a reference to these early descriptions, had figured and described some new plants under the name Zalacca (a latinised name used by BURMANN for the Rumphian Zalack). REINWARDT's material was from Java, where he had studied these plants in the living state; it is specifically identical with what MARTIUS later named *S. Blumeana,* apparently because the older specific epithet was misleading, for the fruits of all Salaccas known to him were edible. Typified on REINWARDT's specimen, *S. edulis* Reinw. becomes the correct name for *S. Blumeana* Mart. The Amboinese material depicted by RUMPHIUS is probably identical with *S. sumatrana,* a species which appears to be widespread in cultivation and to have many forms. The fruits, preserved in brine, that arrived in the 17th century in Europe may have been either *S. sumatrana*

or *S. edulis,* the latter having also more than one form in cultivation. Evidence is available to show that *S. Rumphii* is a binomial actually published by WALLICH with a plate for what has hitherto been known as *S. Wallichiana* Mart. Later in the text of the same book, WALLICH changed the name to *S. edulis,* apparently on the authority of MARTIUS, who at the time probably thought that all Salaccas represented one species only. But the earlier name is valid and so has the priority claim; this view was also defended by BLUME (Rumphia II, 1843, p. 158, sub. Observ.).

Summary

Of the 13 species of the genus, the following are wild in the Malay Peninsula: *S. affinis, S. conferta, S. flabellata, S. glabrescens, S. Rumphii* and *S. Scortechinii.* RIDLEY does not include the last mentioned species in his Flora (1925), nor does he give any reason for this omission. Beccari's plate of the type of *S. Scortechinii* looks like a mixture consisting of a young leaf of *S. affinis* and a spadix of *S. conferta,* but I do not feel justified in making this reduction without being able to compare the original material with recent collections.

Salacca conferta is split into two species by BURRET (1942), under the genus *Eleiodoxa,* as *E. conferta* and *E. orthoschista,* the latter based on material collected in Singapore. Though we have very good material from Singapore, we have very little from Malacca, the type locality of *S. conferta*; on the evidence at present available, I am not able to separate the two species.

S. flabellata is the only new species described here; it is reported to be very common in two places in Kemaman (at Sungei Nipah and at Bukit Kajang). It is the smallest species in the genus and is easily recognized by its undivided leaves, a character not found in any other Salacca except in seedling stages. The species is known from male specimens only.

In the key to the species, the non-Malayan species *S. sumatrana, S. vermicularis* and *S. edulis,* are given in order to make clear the identity of *S. edulis,* which is found occasionally cultivated or as an escape in Malaya, and is probably the species commonly cultivated in Java for the export of its fruits. I have also given the synonyms of *S. edulis,* so that the use of the name is clarified. *S. borneensis* has been reduced to a variety of *S. affinis,* but the variety has not been recorded in Malaya.

KEY TO THE SPECIES

Leaves not divided into separate leaflets, whitish beneath (Eu-SALACCA?)
1. *S. flabellata* Furtado.

Leaves pinnate, whitish beneath or not

Fruit clothed with scales having pungent tips (Eu-SALACCA)

Leaflets whitish beneath

Leaflets equidistant, at least in the upper half of the leaf
2. *S. sumatrana* Becc.

Leaflets inequidistant throughout, often in groups

Male spikes long, erect, spreading, entirely exsert from the spathes
3. *S. vermicularis* Becc.

Male spikes short, congested, nearly enclosed in the spathes
4. *S. edulis* Reinw.

Leaflets green on both surfaces, not whitish beneath

Leaffets distinctly sigmoid at base with smooth costae. Male spikes glabrous outside. Fruit globose or pyriform, suddenly beaked.
5. *S. glabrescens* Griff.

Leaflets oblanceolate, sometimes spinulose on midcosta above. Male spikes tomentose outside. Fruit obovate-pyriform, conically beaked at apex
6. *S. Rumphii* Wall.

Fruit smooth, not covered with pungent scales

Female flowers solitary (LEIO-SALACCA)

Fruit with scales arranged with 21–26 vertical series
7. *S. affinis* Griff.

Fruit with scales in 18–19 vertical series
8. *S. affinis var. borneensis* (Becc.) Furtado

Female flowers accompanied by a neuter flower (ELEIODOXA)

Leaflets straight — 9. *S. conferta* Griff.

Leaflets sigmoid — 10. *S. Scortechinii* Becc.

The Species

A. Section EU-SALACCA (Eu-Zalacca) Becc.

Female flowers each accompanied by a neuter flower; ovary strigose; fruit provided with scales with sharp, upturned tips; seeds 3.

1. **Salacca edulis** Reinwardt in Syll. Ratisb. II (1825) 3; Hubbard et Rehder in Bot. Mus. Leaflets Harv. Univ. I (1932) 9.

Zalacca edulis Reinw. *apud* Bl. in Roem. et Schultes, Syst. Nat. VII (1830) 1334; Wall., Pl. Asiat. Rar. III (1832) 14; Bl., Rumphia II (1843?) 159; Miq., Fl. Ind. Bat. III (1855) 81; Kurz in Natuurk. Tijdschr. Nederl. In. XXVI (1864) 217; Becc. in Malesia II (1886) 64 et in Ann. Roy. Bot. Gard. Calc. XII, 3 (1918) 72 (omnino pro parte typica).

Z. Blumeana Mart., Hist. Nat. Palm. III (1838) 202 (1st ed.) t. 123 et t. 159 fig. 3. et 2nd. ed. (1849) 201; Becc. in Malesia III (1886) 55 et. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1918) 77, t. 46.

BECCARI typified *S. edulis* on the belief that, being the first and only species published under the genus *Salacca*, it had to be typified entirely on the earliest reference given by RUMPHIUS and by REINWARDT. The Rumphian *Zalacca* seu *Rottan Zalak* (Herb. Amb. V, p. 113, t. 57, fig. 2) refers to plants found in Amboina, Bali and Java, though the plate is apparently of a plant cultivated in Amboina; but both the description and the figure are too poor for an accurate determination of the species. On BECCARI's own showing the Rumphian plate should be identified with what he calls *Z. edulis* var. *amboinensis* which, I believe, is a variety of *S. sumatrana* Becc. The earliest reference cited by RUMPHIUS and also by REINWARDT is CLUSIUS's Exot. Libr. II Cap. iv (1605) 266 *(Baly insulae fructus aspero cortice)* which is also cited by C. BAUHIN as *Fructus squamosus pyriformis* in Pin VI (1623) 511; CLUSIUS gives a drawing of a fruit that had reached Europe from Bali preserved in brine. This drawing is quite insufficient for a correct identification of the species.

On the other hand, REINWARDT, the author of the genus and the species, (*S. edulis*), was in Java and it is the Java plant that he had actually studied and named first *Salakka edulis* in Blume, Cat. Gew. Buitenz. (1823) 112 (cf. also p. 4 of this Catalogue for reference to REINWARDT's manuscript work on Java plants), and then in the latinised form quoted above. I have not been able to consult REINWARDT's actual protologue of the species and of the

Fig. 1. S. **edulis**, ♂. (in Hort. Bot. Sing. culta).
A. Speciei habitus. *B*. Spica cum spatha. *C*. Flos masculus.

genus. But the fact that REINWARDT had studied Javanese material in establishing *Salacca* and *S. edulis* should not be overlooked, on the plea that the generic name had been used in pre–1753 books for a different species (a species not easy to be established from the available data). REINWARDT obviously established his species and the genus on the specimens actually studied by him (fruit figured by Martius in t. 159, fig. 3), but consistent with contemporary ideas and to throw light on the previous history of the plants in European literature, he also referred to previous descriptions and drawings of plants which appeared to him identical with his specimens; but this did not mean that, in case these anciently described plants proved different specifically or generically, we should discard Reinwardt's original studies made on clear specimens and typify the species on what he himself could not study satisfactorily. Also under Art. 42 (2) of the Rules we are obliged to consider that REINWARDT established his new genus *Salacca* with reference to his new description based on the living material, not with reference to its previous description given under the same name. This means therefore that we have to identify *S. edulis* with REINWARDT's Javanese material, a drawing of which was published by MARTIUS under *S. Blumeana.*

Thus typified, *S. edulis* Reinw. becomes synonymous with *S. Blumeana* Mart., and it was thus interpreted by MARTIUS (1838) and BLUME (1843?). The probable reason why MARTIUS replaced the specific epithet *edulis* by *Blumeana* is that there were more than one species having edible fruits and many of his contemporaries would employ the epithet wrongly to name any species having an edible fruit; besides, previous to the creation of the new name *S. Blumeana,* WALLICH (1832) had adopted *S. edulis* for *S. Rumphii.* But such considerations are not valid now; and it appears that they were not valid among many contemporary botanists of MARTIUS himself, for BLUME (1843, p. 158 sub-Observatio) states that under "jus prioritatis" *S. edulis* should be the correct name for what MARTIUS had called *S. Blumeana.*

Fortunately this typification of *S. edulis* does not leave the Amboinese material without a name, for I believe it is identical with *S. sumatrana,* which includes three forms or varieties: one with all leaflets equidistant, the second with leaflets subequidistant or obscurely so towards the base, and the third with leaflets distinctly grouped in the basal portion. In all these varieties the leaflets at the leaf-apex seem to be free, not united as in *S. edulis.* The shape of the fruit is not a good diagnostic character in Salacca, as it is determined by

the amount of free space the fruits have for their development; if many of the fruits drop off when young or fail to develop, the remaining fruits have more space and then often have a rounded base, or a less cuneate base than fruits growing closely together.

From the data given of plantings in the Botanic Gardens, Buitenzorg, *S. sumatrana* is also cultivated (or wild?) in Java and Borneo, and probably we have to locate the original home of this species in this region extending as far as Sumatra. *S. vermicularis*, which is closely allied to *S. sumatrana* and to *S. edulis*, is found wild in Borneo, reaching the Kinabalu Mountains at an altitude of about 1000–1500m.

2. **Salacca flabellata Furtado sp. nov.**

Ab omnibus hujus generis speciebus haec differt foliis parvissimis flabellatis apice bifidis, spadicibus flagelliformibus gracillimis, caule brevissimo cum vaginis ad 5 cm. in diam.

Caulis gracilis, brevissimus, in parte folioferente circa 7 cm. altus, cum vaginis ad 5 cm. in diam., in altera parte repens, subterraneus, brevis, plures radices gerens. *Frondes* flabellatae, dimensione variabiles, hic majores tantum designatae; petiolus 1.5–2 m. longus, 5–10 mm. in diam., trigonus vel subteres, basi longe canaliculatus et alis semi-coriaceis mox marcescentibus deciduis vaginatus, aculeis 5–25 mm. longis rigidis saepe porrectis irregulariter sitis, apicem versus paucioribus, minoribus secus dorsum tantum praeditus; flabellum subtus albescens, ambitu elongato obovatum, 80–100 cm. longum, apice latissimum, bifidum, 40–45 cm. latum, basin versus sensim angustatum, infimo oblique cuneatum, summo pinnis paulo sejunctis apice et secus margines liberas setosis, rachidi 50–60 cm. longa, basi tantum armata vel non. *Spadices masculi* 1–2 m. longi, axi 3–4 mm. in diam., funiculati, gracillimi, indivisi, in axilla frondis solitarii, basi petioli perforata orientes, spiculas 1.5–3 cm. longas, in spathae axilla primariae solitarias, longe pedicellatas, pedicello quam internodus paulo breviore, spathas secundarias, fere chartaceas ferentes; spathis primariis quam internodi 5–10 cm. longi longioribus, coriaceis, apice mox fibrosis; floribus masculis clavatis, circa 4 mm. longis; corolla quam calyx fere duplo longiore.

Stem smallest in the genus, with sheaths 5 cm. through, hardly above ground. *Leaves* similar, of varying dimensions, the largest as follows: petiole 1.5–2 m. long, 5–10 mm. in diam., trigonal in its basal half, almost terete in the

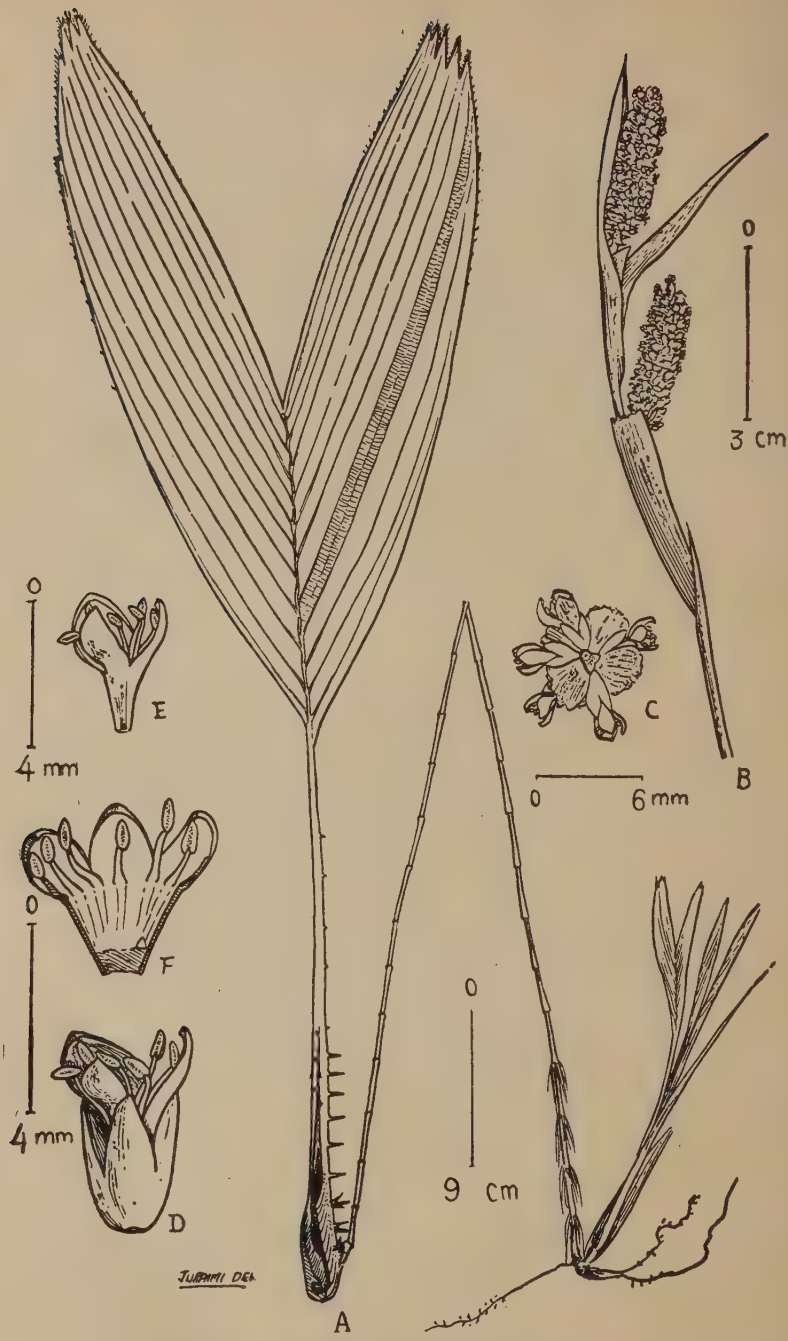


Fig. 2. **S. flabellata,** ♂. (Holotypus: Corner 30,525).

A. Frons, cum spadice apice foliis parvissimis praedito. *B*. Spadicis apex cum spathis spicisque. *C*. Sectio horizontalis ex spicae medio. *D*. Flos sub anthesi. *E*. Flos, sepala resecta. *F*. Corolla aperta cum staminibus.

upper; channelled and provided with deciduous, vaginal wings at base, armed irregularly with 5–25 mm. long rigid spines, which become fewer, smaller towards the apex (where they are dorsal only) and in the base of the leaf rachis; lamina flabellate, deeply bifid at apex, whitish beneath, obovate, 80–100 cm. long, 40–45 cm. wide at apex, gradually narrowed towards the base where it is obliquely cuneate; rachis 50–60 cm. long and armed or not at base; the lamina with a short free tip corresponding to each vein, setose along the margins and at apices. *Male spadix* emerging through a puncture in the dorsum of the petiole-base, whip-like, solitary, 1–2 m. long, 3–4 mm. in diam., with internodes 5–10 cm. long; primary spathes slightly longer than the internodes, tubular, soon split into a fibrous limb in the upper half; spike one in the axil of each spathe, 1.5–3 cm. long, 10–12 mm. through, provided with a pedicel slightly longer than the spadix-internode; secondary (empty) spathes on the pedicels, chartaceous; flowers male, clavate, 4 mm. long.

MALAYA: *Kemaman,* Sungei Nipah, on hillsides and in swamps by streams (Corner, 30,525, vern. nom. *Salak Chabang*).

Plants with much smaller leaves and spadices are also found in the same clump, which is formed of distant stems united together by whip-like branches or spadix-axes. However in the description given above measurements are those of the largest specimens seen in the collection.

The collector notes that this species is quite common also at Bukit Kajang, Kemaman, on the hillside near Ulu Ayam swamp. The spadices are reported to grow first upwards and then down or straight over the surface of the ground, sometimes burrowing under humus or becoming silted over in swampy places; the flowers are recorded to be produced on the spadix even after it has produced a young palmlet at the end. This phenomenon of producing a new stem at the end of a spadix is noticed also in *S.Rumphii*. Both this species and *S. flabellata* have long spadices which reach the ground, where a spadix will receive the necessary stimulus to produce shoots and roots; in other species such conditions are only possible when the stems are very young, and hence it has not been possible in these to observe the phenomenon of branching.

S. flabellata is the only species in the genus to produce leaves having their pinnae united even in adult stages; in other species the phenomenon may be noticed in seedling stages only.

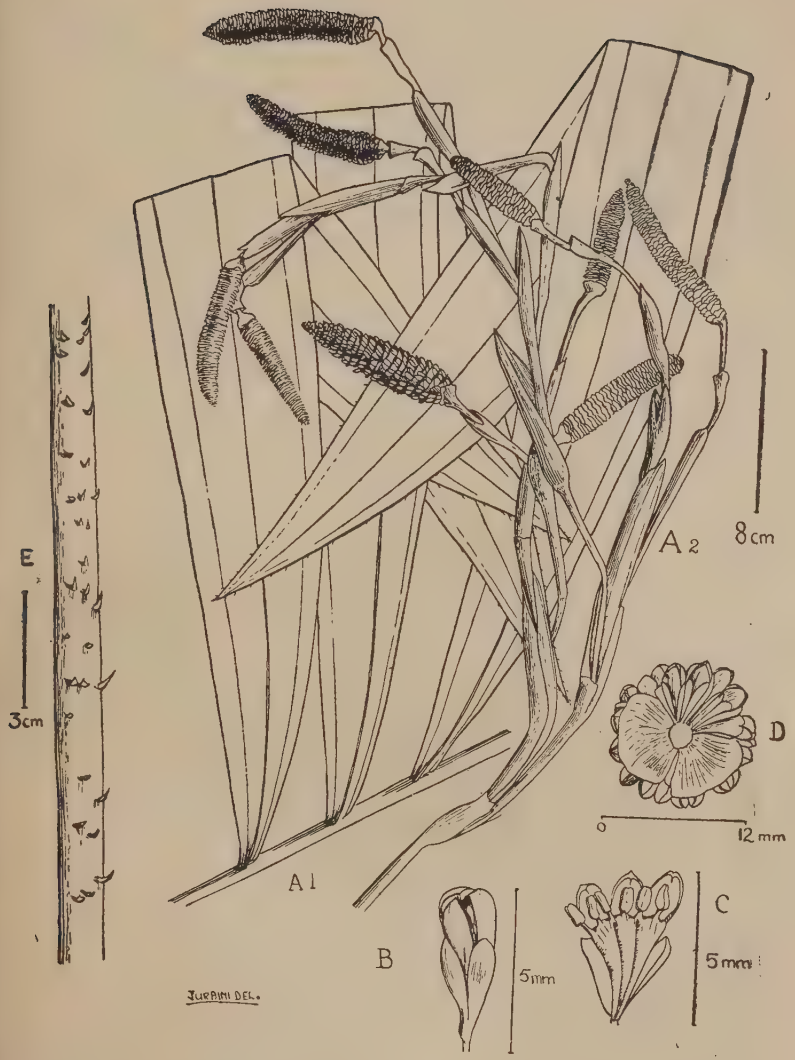
3. **Salacca (Z) glabrescens** Griff. in Calc. Journ. Nat. Hist. V (1844) 14; Mart., Hist. Nat. Palm. III ed. 2 (1849) 202; Griff., Palms Brit. Ind. (1850) 17 t. 179; Becc. et Hook. f., Fl. Brit. Ind. VI (1893) 473; Curtis in Journ. Roy. Asiat. Soc. Str. Branch XXV (1894) 151; Ridl., Mat. Fl. Malayan Pen. II (1907) 170; Becc. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1918) 86 tt. 52 et 53; Ridl., Fl. Malay Pen. V (1925) 33.

Z. Blumeana Mart. *sensu* Ridl., in Trans. Linn. Soc. III (1893) 392.

Z. edulis Reinw. sensu Becc. in Malesia III (1886) 64 partim.

Stems short, trailing or without any part visible above ground, tufted. Leaves very large, 4–5 m. long; petiole 1–1.25 m. long, decidously rusty furfuraceous; spines 3–5 cm. long or shorter, confluent in oblique or horizontal rows, shorter and fewer in upper parts, and in the rachis of the leaf lamina. *Leaflets* in groups of 2–3, nearly equidistant in upper parts of the young leaves, 3–costate, sigmoid, concolorous, smooth on both surfaces, spinulous along the margins; the largest mesial, 30–35 cm. long, 5–6.5 cm. wide; lowest narrower, and the uppermost often united in a bilobed flabellum. *Male spadix* 25–40 cm. long, deciduously rusty furfuraceous in axis and spathes, diffusely divided into short branches; primary spathes 8–20 cm. long, shortly tubular at base, ventrally opened into a broad, boat-shaped, acuminate limb; spike cylindrical, 4–10 cm. long, stalked, produced on primary, secondary or tertiary branches, exserted fully from its own spathe, glabrous outside or very nearly so. *Female spadix* slightly shorter and less branched than the male; spikes 7–13 cm. long, 2–2.25 cm. wide, externally glabrous or very slightly squarrose; the female flower large, 8 mm. long, accompanied by a smaller neuter flower. *Fruit* pyriform, 4–5 cm. long, 3–4 cm. in diam., gradually narrowed towards the base, abruptly contracted into a beak 5–10 mm. long, or longer in young fruits, covered with scales having upturned points; seeds 2–3 (when two semi-oboval); embryo opposite to the apical pit, slightly above the basal point.

MALAYA: *Trengganu,* Ulu Brang, Tersat, alt. 1000 m. (Moysey and Kiah, 33,395). *Kemaman,* Ulu Kajang (Corner, 30,495). *Pahang,* Tahan (Ridley 3,141); Kuala Lipis (Machado sub Ridley num. 11,613); Gunong Senyum (Henderson, 22,224, as *Zalak Utan*); Pelangai or Manchis (Burkill and Haniff, 16,791, as *Buah Salak*). *Penang,* Balek Pulau, alt. circa 660 m. (Curtis in June 1890); Telok Bahang (Curtis's Collector, as *Choochae*); Government Hill



Fig, 3. **S. glabrescens,** ♂. (Nur 11,965).

A1. Frondis pars cum foliolis. *A2.* Spadicis pars. *B.* Alabastrum. *C.* Flos apertus ut staminum insertio appareat. *D.* Spicae sectio transversa. *E.* Petioli pars.

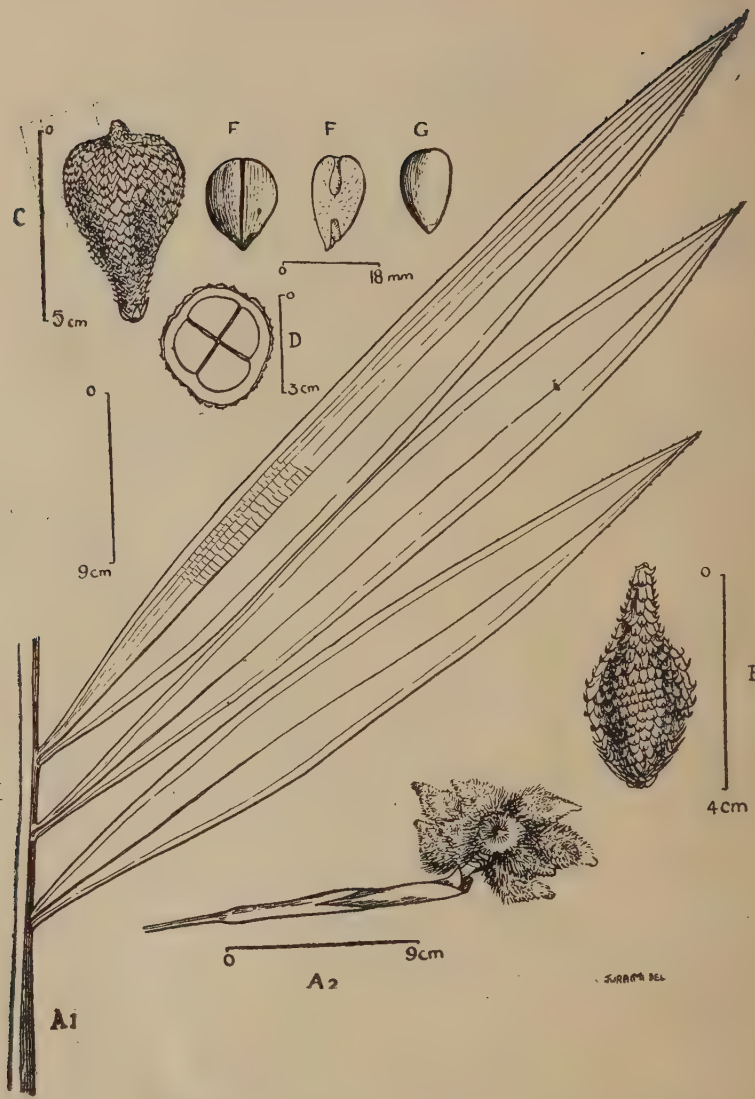


Fig. 4. S. **glabrescens**, ♀. (*A* and *B:* Curtis 2,435; *C-G:* Henderson 22,224).

A1. Pars rhacheos e basali frondis parte resecta, cum foliolis. *A2.* Ramus spadicis fructiferus. *B.* Fructus immaturus. *C.* Fructus maturus. *D.* Sectio fructus transversa ut dispositio seminum 4 appareat. *E.* Semina dua ex fructu singulo. *F.* Semen verticaliter discissum. *G.* Semen integrum.

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(Ridley in Feb. 1892); Penara Bukit, alt. circa 660 m. (Curtis 2,435); Moniot's Road (Curtis in April 1890). *Perak*, Sungai Gepai, Bidur (Corner, 31,484 and 31,485); Bukit Chong, Kroh (Furtado, 33,017 as *Buah Kumbah*); Padang Chong, Kroh (Furtado, 33,006 as *Pokok Kumbah*). *Selangor*, Sempang (Ridley in Aug. 1909); Ulu Selangor (Goodenough in 1899); Kuala Lumpur (Ridley, 3,142 partim). *Singapore*, Garden Jungle, probably cultivated (Furtado 29,207).

This is easily distiguished by its sigmoid, grouped and concolorous leaflets, and by its spikes being externally glabrous or almost so, and also by its fruits being abruptly contracted into a long beak.

The shape of the fruits depends largely on whether they are congested or not; when congested, the fruits do not get space enough for the full development of the base and so become pyriform, gradually cuneate to the base. In young fruits, the beak is very long and gradually narrowed towards the apex; and it is therefore quite possible that the fruits, when given space, will develop at the base so as to become globose as described by HOOKER (Fl. Brit. Ind. VI, p. 474). Fruits with 4 seeds are also seen.

4. **Salacca** (Z) **Rumphii** Wall., Pl. Asiat. Rar. III (1832) tt. 222–3 and 224 and Index; Bl., Rumphia II (1843) 161.

Z. Beccari Hook. f., Fl. Brit. Ind. VI (1893) 474 quoad fructus.

Z. edulis Reinw. sensu Wall. op. cit. III (1832) 14 text; Griff., in Calc. Journ. Nat. Hist. V (1844) 8 et Palms Brit. Ind. (1850) 10, t. 175 (spadix only); Curtis in Journ. Roy. Asiat. Soc. Str. Branch XXV (1894) 151.

Z. macrostachya Griff. in Calc. Journ. Nat. Hist. V (1844) 13; Mart., Hist. Nat. Palm. III 2a. ed. (1849) 202; Griff., Palms Brit. Ind. (1850) 15, t. 178 A, B and C; Becc. in Malesia III (1886) 66.

Z. Wallichiana Mart., op. cit. III, ed. 1a (1838) 201, tt. 118, 119 et 136, et ed. 2a. (1849) 200, et (1850) 325; Kurz in Natuurk. Tijdschr. Ned. XXVII (1864) 214, et For. Fl. Brit. Burma II (1877) 511; Becc., Malesia III (1886) 66; Becc. et Hook. f., Fl. Brit. Ind. VI (1893) 473; Ridl., Mat. Fl. Malayan Pen. II (1907) 170; Becc. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1918) 83, tt. 50, 50A, et 51; Ridl., Fl. Malay Pen, V (1925) 33; Blatter, Palms Brit. Ind. and Ceyl. (1925) 265, pl. 50.

Stem tufted, trailing or almost absent above ground. *Leaves* very large; petiole 1.50–2.50 m. long, armed with 4–8 cm. long spines arranged in oblique rows or rings; lamina

Fig. 5. S. **Rumphii**, ♂. (Furtado 33, 025; Fructus tantum: Furtado 33, 017).
A. Spadix apice folia parvula ferens. *B*. Frondis pars. *C*. Sectio spicae transversa. *D*. Fructus immaturus. *E*. Spathella apice cum paleis barbae. *F*. Sectio alabastri verticalis. *G*. Bracteola annulata. *H*. Flos apertus cum staminibus.

2.75–3.50 m. long, armed along the dorsum of the rachis with shorter spines which are approximate in the lower regions, solitary and distant in the upper. *Leaflets* in groups of 2–4 each, divergent, oblong-lanceolate, slightly falcate or sigmoidly so towards the apex, slightly paler beneath, abruptly acuminate, often ending in a filiform tip, smooth except occasionally for spinules above in the apical portion of the midcosta; margins setose; mesial leaflets largest, 60–80 cm. long, 7–9 cm. wide; apical leaflets shortest, basal narrowest. *Male spadix* deciduously rusty furfuraceous in axis and in spathes, 30–80 cm. long, divided into several secondary and tertiary pendulous spike-bearing branches; primary spathes lacerate longitudinally; spikes cylindrical, solitary, distant, shorter than the axillant spathe, covered with brown wool surrounding the male flowers. *Female spadix* larger than the male, similarly divided and covered with deciduous rusty furfur; the spike tomentose even externally; female flowers larger than the males, each accompanied by one neuter flower. *Fruit* obovate pyriform, or somewhat oblong, 7–8 cm. long, 4 cm. across, covered with light-coloured or fulvous scales; seeds 3, embryo basal being exactly opposite to the apical pit.

SIAM: cult. Hort. Bot. Bogor. (Furtado 31,148).

MALAYA: *Perlis,* Ginting Kabok (Ridley 15,362). *Pahang,* Tahan (Ridley 3,142 partim). *Perak,* Bukit Chong in Kroh (Furtado 33,017B); Ayer Panas in Kroh (Furtado 33,025). *Province Wellesley,* Permatang Bertam (Ridley 7,003); Bukit Juru (Ridley, sub. nom. vern. *Kombar*).

DISTRIBUTION: Burma and Sumatra.

The change in nomenclature above indicated is needed because there is evidence that WALLICH issued the plates and the Index to Pl. Asiat. Rar. III (1832) earlier than the text, so that even in the Index (to the plates), WALLICH retained the name *S. Rumphii* for his species. In the text, however, WALLICH changed the name to *S. edulis,* which he did apparently on the advice of MARTIUS (see also BLUME's manner of citing the synonym under *S. Rumphii*); and referred to the prior publication of the plate under the other name. BLUME's remark (op. cit. p. 158 in Observatio) that *S. Rumphii* Wall. has a "jus prioritatis" over *S. Wallichiana* Mart. corroborates this conclusion. GRIFFITH (op. cit. sub *Z. edulis*) and the editors of Index Kewensis also imply that *S. Rumphii* was published by WALLICH.

This species was based on male specimens from a Sumatran plant cultivated in the Botanic Gardens, Calcutta, and on female fruiting specimens collected by WALLICH in

Burma. The species is common in Malaya, though seldom collected. It has perhaps disappeared from some places like Penang and Singapore, where it was formerly reported to occur. The species is sometimes confused with *S. glabrescens* which has sigmoid leaflets and externally glabrous spikes. When CURTIS stated that *S. edulis* as described by GRIFFITH did not occur wild anywhere in the Malay Peninsula, it is obvious that he was speaking of the real *S. edulis*, and not of the plants described by GRIFFITH under that name.

The spadix of this species often produces a leafy sucker at its end.

B. Section LEIO-SALACCA (Leiozalacca) Becc.

Female flowers solitary; ovary smooth; fruit-scales without any pungent tips; seeds 1–3.

5. **Salacca** (Z) **affinis** Griff. in Calc. Journ. Nat. Hist. V (1844) 9 et Palms Brit. Ind. (1850) 12, t. 176 A, B and C; Mart., Hist. Nat. Palm. III (1849) 202, t. XXXI f. iv; Becc., Malesia III (1886) 67; Becc. et Hook. f., Fl. Brit. Ind. VI (1893) 169; Ridl., Mat. Fl. Malayan Pen. II (1907) 169 partim, et Fl. Malay Pen. V (1925) 32 partim.

Stem short, tufted, hardly above ground. *Leaves* 3–4 m. long; petiole armed with light-coloured, unequal, 3–6 cm. long, mostly approximate, deflected or ascendent spines which become gradually shorter and geminate or solitary on the rachis; lamina 1.75–2.50 m. long. *Leaflets* in one plane, in groups of 2–3 or 4 on each side of the rachis, oblanceolate-sigmoid with a slightly falcate point, often ending with a filiform apex, 3–costate, smooth on both surfaces, spinulous along the margins towards the apex; mesial leaflets 35–45 cm. long, 6–10 cm. wide; lower leaflets smaller, apical ones often united. *Male spadix* 50–100 cm. long, having short branches which bear spikes either solitary or in groups of 2 or more; spathes longer than the spikes, lanceolate, acuminate, more or less lacerate, thinly covered with a deciduous rusty furfur outside; spikes 4–6 cm. long, 8–12 mm. in diam., tomentose outside, bearing two male flowers at each spathel. *Female spadix* shorter, 30–50 cm. long, covered with a long split and lacerate spathe; branches shorter than the primary spathes, 5–10 cm. long; secondary spathes shorter but similar, bearing in their axils spikelets each up to 3 cm. long and bearing a few solitary female flowers; in the upper half of the spadix the spikelets are borne directly on the main axis. *Fruit* ovoid, sometimes

Fig. 6. S. **affinis**, ♂. (Furtado 31,149).

A. Petioli pars adulti. *B*. Petioli pars juvenilis. *C*. Frondis pars. *D*. Spadix. *E*. Spica cum spatha. *F*. Flos post anthesin. *G*. Flos apertus.

Fig. 7. S. **affinis**, ♀. (Furtado 33,058).

A. Spadicis ramus. *B*. Ramulus spadicis cum fructibus maturis. *C*. Petioli pars. *D*. Frondis pars cum foliolis. *E*. Semina tria ut in pericarpii involucro disposita. *F*. Semen integrum. *G*. Semen verticaliter discissum.

obovoid or irregular in shape, tapering both ways, mammillate at apex, covered with smooth scales disposed in 22–24 series (24–26 according to Beccari) ; seeds 3 or less, embryo basal exactly, opposite to the apical pit.

MALAYA: *Kedah,* Sungai Labong at Baling (Furtado 33,058 as *Buah Salak*) ; *Dindings,* Gunong Tungal (Ridley in II–1890). *Malacca,* Selandor (Alvins, 332 as *Pokok Ramgam*) ; Batu Tiga (Goodenough, 1,419 as *Salak Utan*). *Singapore,* Bukit Timah (Ridley in 1898) ; Chan Chu Kang (Ridley 4,421 partim, as *Salak Hutan*).

SUMATRA: cult. Hort. Bot. Bogor., probably Palembang (Furtado 31,149).

5-b. **Salacca affinis** var. **borneensis** Furtado **stat. nov.**

Z. borneensis Becc., Malesia III (1886) 68 et in Ann. Bot. Gard. Calc. XII, 3 (1918) 94, t. 59B.

A typica differt fructus squamis per series 18 dispositis.

This differs from the type in having the scales of the fruit disposed in 18 vertical series.

BORNEO: *Sarawak,* Kuching (Beccari).

So far known only from the type collection. There is a great deal of variation in the number of series of scales; all the Malayan fruits I examined show 22–24 series, whereas Beccari reports that in the Malayan specimens he examined there were 24–26 series.

C. Section ELEIODOXA Becc.

Female flowers each accompanied by a neuter flower; ovary smooth; fruit-scales without any pungent tips; seed 1.

6. **Salacca** (Z) **conferta** Griff. in Calc. Journ. Nat. Hist. V (1844) 16; Mart., Hist. Nat. Palm. III, ed. 2a (1849) 201, tt. 173 et 174; Griff., Palms Brit. Ind. (1850) 19, tt. 180 A, B and C; Becc. in Malesia III (1886) 67; Becc. et Hook. f. in Fl. Brit. Ind. VI (1893) 473; Ridl., Mat. Fl. Malayan Pen. II (1907) 169; Becc. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1918) 95, t. 60; Ridl., Fl. Mal. Pen. V (1925) 32.

Z. affinis Griff. *sensu* Ridl. op. cit. II (1907) 169 et Fl. cit. V (1925) 32 partim.

Eleiodoxa conferta (Griff). Burret in Notizbl. Bot. Gart. Berlin XV (1942) 734.

E. orthoschista Burret in Notizbl. cit. XV (1942) 735.

Stem tufted, short or hardly above ground. *Leaves* large, 5–6 m. long or more including 2.5–3 m. long decidously rusty furfuraceous petiole; the latter covered with white-coloured black-tipped narrow spines 4–5 cm. long usually united at base into short oblique or transverse series; the spines on the dorsum of the rachis of the lamina shorter,

Fig. 8. **S. conferta.** (Furtado 37,923).

A. Spadicis ramus. *B* and *C*. Petioli particulae. *D*. Semen verticaliter discissum. *E*. Semen integrum. *F*. Fructus. *G*. Frondis pars cum foliolis.

often slenderer and fewer. *Leaflets* numerous, equidistant, alternate or subopposite, gradually narrowed nearly to a straight, slightly unequal base, almost ensiform, slightly unequal at apex, more or less spinulous in the costae above, smooth below, setose along the margins; the mesial largest, 50–70 cm. long, 4–5 cm. wide; the two terminal leaflets slightly connate at base and at times also laterally united with the next pair below. *Male spadix* erect, about 25–40 cm. long, congested, outermost spathe not seen; spikes borne on axis and on primary branches which are at times as long as the primary spikes or slightly longer, the basal spathes partly lacerate, gradually narrowed to an acuminate point; secondary spathes entire or very often so, shorter, frequently narrowed suddenly to an acuminate point; spikes bifarous, almost glabrous outside, almost equal except the terminal ones which are often smaller; male flowers in pairs at each spathel. *Female spadix* similar to male, but shorter, erect, congested to an oblong, ovoid mass, with very short primary, palmate branches, each branch being again divided into many smaller branchlets each bearing 1–2 or more spikes; outermost spathe 60 cm. long, tubular at base, with a long lanceolate acuminate limb, armed outside with long white black-tipped spines, deciduously rusty furfuraceous, soon lacerate, fibrous; secondary spathes lacerate and in fruiting spadix often fibrous; larger spikes 10–15 cm. long, about 2 cm. through; flowers usually a neuter and a female at each spathel, equal in size, but sometimes two female flowers without any acolyte neuter or with a neuter between the two female may be found. *Fruits* crowded, very irregular in shape but tending to become turbinate, convex or flat and shortly mucronate at apex, 4 cm. long, 2–3.5 cm. wide, with straw coloured smooth scales arranged in 21–24 series; seed solitary, surrounded with a fleshy integument, compressed longitudinally, two or three times as broad as high, nearly circular or reniform, 4–5 cm. high, 12–15 mm. broad (Beccari noticed one seed 10 mm. high, 22 mm. broad), with a broad shallow cavity at apex, and embryo at base.

MALAYA: *Kelantan*, Kota Bahru (collect. ignot.). *Dindings*, Lumut (Ridley in II–1892; Ridley and Curtis in III–1892). *Malacca*, loc. incert. (Alvins). *Johore*, Gunong Pulai (Best, 8,322 as *Asam Paya*). *Singapore*, Chan Chu Kang (Ridley 3,143 as *Asam Payah*; 3,502; 4,421 partim, as *Salak Hutan*; 4,622 as *Salak Hutan*); Jurong (Corner, 26,200: *isotype* of *E. orthoschista*; Furtado 37,923; Ngadiman 37,933 and 37,934).

Fig. 9. **S. conferta.** (Ngadiman 37,933).

A. Spadicis ramus. *B*. Spatha prima, universalis. *D*. Flores (neuter femineusque) ut in axilla spathellae siti. *E*. Flos femineus post anthesin. *F-G*. Bracteolae. *H*. Spathella. *I*. Flos neuter. *J*. Ovarium. *K*. Corolla floris feminei aperta cum staminodiis. *D*. Floris corolla neutri aperta cum staminodiis.

BORNEO: *British North Borneo,* Jesselton at Lumot (Cuadra, A1,338, as *Asam Kolambi* in Brunei language).

DISTRIBUTION: Reported to occur also in Rhio and Bangka Islands.

There is a good deal of variation in this species as to size of its fruit as well as in the size and spinescence of the leaflets. BURRET has established *Eleiodoxa orthoschista* as distinct from *E. conferta* (*S. conferta*) but on the material available in Singapore, which lacks good specimens from Malacca (the type locality of *S. conferta*), I hesitate to admit his separation. *S. conferta* was apparently very widely spread in Singapore and its fruits were even sold in local bazaars by Malays (cf. Ridley in Journ. Roy. Asiat. Soc. Straits Settl. XXXIII, 1900, p. 176). RIDLEY has confused some material of this species with *S. affinis*.

7. **Salacca (Z) Scortechinii** Becc. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1919) 97, t. 61.

Stem apparently similar in habit to *S. conferta*, but smaller. *Leaves* about 3–4 m. long including 1.5 m. petiole; spines few, distant, solitary, rarely united into lines or series, 10–15 mm. long on petiole becoming smaller and more distant on the rachis. *Leaflets* numerous, equidistant, distinctly sigmoid, 3–costate, smooth on both surfaces, spinulous along margin; mesial 45 cm. long, 3–3.5 cm. wide. *Female spadix* like that of *S. conferta*, but smaller, with shorter and narrower spikes. Fruit globose-turbinate, 2–2.5 cm. in diam.; seed discoid.

MALAYA: *Perak*, loc. incert. (Scortechini as *Udang*).

This species is known only from the type collection, which perhaps is the reason why RIDLEY has ignored it. I have not seen the type and there is nothing in the Singapore herbarium which would match the plate given by BECCARI. It differs from *S. conferta* by its small, mostly solitary spines on the petiole and by its falcate-sigmoid leaflets. From the plate the species looks like a mixture consisting of a young leaf of *S. affinis* and a spadix of *S. conferta*; but without any comparative study, it is unsafe to make this reduction.

WILLIAM FARQUHAR'S DRAWINGS OF MALACCA PLANTS

By I. H. Burkill.

The Royal Asiatic Society of Great Britain and Ireland possesses a volume of paintings of plants, 55 in all, which was given to it in 1827 by Lieut.-Col. William Farquhar of the Engineers, the first Resident and Commandant of Singapore. In Farquhar's handwriting on the fly-leaf is written "Medicinal plants, etc., of Malacca" and his name. It is obvious that the paintings are part of the "very large collection of drawings and subjects of Natural History" which Jack said Farquhar had made in Malacca (see Jack's letters to Wallich (Jour. Straits Branch Roy. As. Soc. 73, p. 151; 1916)).

In 1818 Raffles was instructed by the Marquess of Hastings to seek a settlement to the eastward of Malacca, and, sailing from Calcutta in December with William Jack as his personal physician, reached Penang on the 31st; Farquhar who had been in Malacca since 1803, had been put under Raffles' orders and had arrived in Penang on the 30th bringing all or part of that collection with him. Jack in the letter cited wrote "I have just had an opportunity of examining his (Farquhar's) drawings of Malacca plants. Most unfortunately from want of scientific acquaintance with the subject they are deficient in many essential points of dissection; but they will be extremely useful as a guide by taking the native names .... and making inquiries." Wallich says that Farquhar employed a Chinese artist. The pictures would be his work; and there is no reason to think that they are not all by one hand. Some of this artist's brush-work is very beautiful; some of his drawing is conventional and unreal; half of the pictures represent no more than the vegetative parts. Of course, Jack, now for the first time in Malaya, would feel it hopeless to put botanical names without flowers; and his criticism was just.

Under each picture (with seven exceptions) the Malay name is written in Arabic characters; one hand wrote the names under the first 25 pictures and numbered them; another wrote the names under the rest, but did not number them. Doubtless Farquhar used Malays on his staff for this; and there is none of his own handwriting anywhere; but it is clear that from somewhere there was a direction in the choice of subjects, because in the time of the first clerk Zingiberids were favoured: in the time of the second,

esculent roots had some favour. Pencilled numbers are present also, and this numbering shows that two paintings that were numbered 9 and 47 were removed before the rest were bound. The volume was bound by a book-binder in Paternoster Row, London; and a numbering in ink at the tops of the pages appears to have been done at the time of binding: this numbering takes no notice of the missing two. After the binding had been done, someone transcribed the Malay names into English characters, first in pencil and then inked them; and the same hand added a few notes, the longest of which is on the use of Croton seeds among the Tamils. This hand sometimes introduced mistakes—for instance, wrote *rambaga* (for *rĕmbega*) on the illustration of *Abutilon indicum* to which it does not belong, and, faced by a picture of the race of *Zingiber officinale* known as *halia padi*, though properly so named in Malay, wrote *aliea bara* which belongs to a different race.

Scattered on the pages are various attempted determinations, sometimes wild, in other hands, all assuredly written after the volume left Farquhar's possession. Disregarding them, I have made the following inventory by the numbers in ink:—

1. sĕrunai laut—*Wedelia biflora* DC.
2. kĕtuwir—*Derris trifoliata* Lour. (D. uliginosa Benth.).
3. balek angin—*Mallotus paniculatus* Muell.-Arg.
4. balek adap—*Mussaenda*, probably *mutabilis* Hook. f.
5. lĕnggundi—*Vitex trifolia* Linn., an unusual form with simple leaves.
6. hujan panas—*Phyllanthus pulcher* Wall.
7. tulang-tulang—probably one of the Rubiaceae.
8. gĕndarusa—*Gendarussa vulgaris* Nees.
9. (without a name)—*Abutilon indicum* Don.
10. jĕringau—*Acorus calamus* Linn.
11. tutup bumi—*Elephantopus scaber* Linn.
12. kĕnchur—*Kæmpferia rotunda* Linn.
13. lĕmpoyang wangi—*Zingiber aromaticum* Valeton.
14. lĕnjuang—*Cordyline fruticosa* Gœppert.
15. bongĕlai—*Zingiber cassumunar* Roxb.
16. aliya bara—*Zingiber officinale* Linn., a pungent race of ginger.
17. tĕmu kunchi—*Gastrochilus panduratum* Ridl.
18. lĕngkuas—*Languas galanga* Stuntz.
19. lĕnguas ranting—*Languas melanococca* Burkill.
20. tĕmu pauh—*Curcuma mangga* Valeton & van Zyp.
21. tĕmu gajah—*Curcuma* probably *xanthorrhiza* Roxb.

22. haliya padi—*Zingiber officinale* Linn., a somewhat acrid race.
23. nara pusi—*Voandzeia subterranea* Thouars.
24. rumput kĕmĕnyan—*Salomonia* sp., agreeing with no known species.
25. ati-ati—*Coleus atropurpureus* Benth.
26. pokok jarak—*Ricinus communis* Linn., the Castor oil plant.
27. (without a name)—*Hibiscus sabdariffa* Linn., the Rozelle.
28. pokok sireh—*Piper betle* Linn., the Betel pepper plant.
29. tuba darat—*Derris trifoliata* Lour. as regards the fruit; but *D. heptaphylla* Merr. as regards the flowers.
30. rĕmbega—*Calotropis gigantea* R. Br.
31. don tumboh duan—*Bryophyllum pinnatum* Kurz.
32. ubi tĕropong—*Dioscorea esculenta* Burkill, the Lesser Yam.
33. kĕledek puteh—*Ipomoea batatas* Lam., a rather curious race.
34. ubi Jawa—*Dioscorea alata* Linn., probably Roxburgh's *D. atropurpurea*.
35. (without a name)—an epiphytic orchid.
36. (without a name)—another epiphytic orchid.
37. ubi Bĕnggala—*Manihot utilissima* Pohl, the Tapioca plant.
38. pĕnggaga—*Hydrocotyle asiatica* Linn.
39. kĕladi puar—*Typhonium trilobatum* Schott.
40. chĕmĕkian—*Croton tiglium* Linn., the Croton oil plant.
41. kunyit—*Curcuma domestica* Valeton, the Turmeric plant.
42. kĕladi sĕminyak—*Colocasia esculentum* Schott, a pink skinned race.
43. kĕladi bĕlanda—the same, a pale brown skinned race.
44. kĕladi Jawa—the same, a deep violet skinned race.
45. kĕladi sĕrakeh bĕnuwa—the same, with very numerous daughter tubers (probably the same race now known as kĕladi rakit).
46. nasi-nasi—*Psychotria* sp.
47. balam—*Madhuca malaccensis* H. J. Lam.
48. sunti—*Adinandra*, probably *A. acuminata* Korth.
49. pinang utan—*Pinanga* sp.
50. chengkoh—*Mesua ferrea* Linn.
51. bidara pahit—*Eurycoma longifolia* Jack.
52. (without a name)—*Hibiscus abelmoschus* Linn.

53. (without a name)—*Clerodendron paniculatum* Linn.
54. kĕchubong puteh—*Datura metel* Linn.
55. (without a name)—*Connarus ferrugineus* Jack.

It is obvious that most of the plants came from gardens in Malacca; others would be found in the untidy ground which surrounded the port and was kept partly cleared that unwelcome visitors might not approach unseen. Only four are actually trees. It is interesting to read a note which calls the Tapioca the best tuber available in Malacca. Of the four races of kĕladi (nos. 42–45) local tradition, as incorporated in the names, attributed one to Java and a second to importation by the Dutch. The Greater Yam seems to have attracted less interest; and the Lesser Yam (no. 32) seemed to the writer of the notes to need this comment—"a most excellent vegetable partaking of the yam and sweet potato"—as if it were unfamiliar. Only one race of the Sweet potato is figured and that a curious one. Of 'greens', pĕnggaga alone obtained a picture. The pictures of the Zingiberids are praiseworthy representations of flowerless, and, in general, not fully grown plants; and Jack would be helpless in face of them. The plants of magic in medicine,—gĕndarusa (no. 8), tutup bumi (no. 11), lĕnjuang (no. 14) and *Clerodendron paniculatum* (no. 53)—are pictured, the first in its dark form, because the dark is reputed to be the more powerful; so too lĕnjuang is figured in its deep claret form. It is interesting to observe tutup bumi drawn as if from garden soil, whereas tutup bumi in order to possess the pentacle of Solomon's seal should be grown on sun-dried hard soil. Of medicines that every Malay uses without any harm to himself, sĕrunai laut (no. 1), lĕnggundi (no. 5), ati-ati (no. 25), hujan panas (no. 6) and balek angin (no. 3) are figured; and so are potent drugs as Croton and Datura. Farquhar's title 'Medicinal plants etc.' is justified.

The use of sunti for Adinandra is unexpected. The name nara pusi appears in R. J. Wilkinson's Malay-English Dictionary (1932, pp. 165 and 292) as of an unidentified plant. It is now possible with reasonable certainty to equate it with *Voandzeia subterranea*, the Bambara Groundnut, though the Chinese artist did not draw the secondary venation in the leaves correctly, made the runners unduly thick and had neither flowers nor the characteristic pods which the plant buries in the soil. Arab traders probably brought the seeds to Malacca, and Zanzibar was a likely source.

FLORA MALESIANA

This promises to be the greatest undertaking of its kind ever achieved. The number of species of higher plants to be described in the whole Malaysian region is estimated at 25,000 to 30,000. The largest comparable work previously accomplished was the Flora of British India, which included about 14,000 species.

The sample part already published gives indications of the scope of the whole. First we have the beginning of the essay on general considerations which is to introduce Vol. 4. This is headed with the remark "we should endeavour to determine how few, not how many species are comprised in the Malaysian Flora". Copious quotations are given from Hooker's introductory essay to his Flora Indica, as Dr. van Steenis believes that the considerations there presented by Hooker still largely hold good today. In particular, Dr. van Steenis emphasizes the great need for monographic treatment of all groups, without which no proper judgement of individual species can be made. He goes on to survey variation among Malaysian plants, its many causes and manifestations; first variations induced by the environment and then those bound to the genotype are discussed. He is strongly of opinion that a narrow concept of species is neither in accordance with the modern genetic viewpoint nor with the best practical interests of taxonomy.

Next come the first 39 pages of taxonomic revisions, beginning the text of Volume 4. The two-column arrangement for the individual descriptions of species, in smaller type than the main family and generic headings which cross the whole page, is convenient and excellently set up. The details of the arrangement are to be standardized for all families, and provide necessary information compactly and adequately. One would like to see some more brief notes on the probable affinities of small families to larger ones, such as that given by Dr. van Steenis himself for Ancistrocladaceae; also notes on the basis of classification within the larger families. The illustrations are good and excellently reproduced, but in a few cases details of flowers are not given. It is most desirable that small drawings to show floral structure should be given in at least one species in each genus. Drawings to show details of floral parts would for example be a helpful supplement to the excellent line drawings showing external form of plants in Burmanniaceae.

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The publication concludes with brief samples of treatment of Volume 1 (Malaysian Plant Collectors and Collections, a Cyclopædia of botanical exploration in Malaysia), Volume 2 (Malaysian Plant Life) and Volume 3 (Malaysian Plant Geography). These three volumes together will form a most comprehensive introduction to the study of the Malaysian flora.

This great work could only be accomplished by co-operation of many botanists in many different countries. But it needs also a co-ordination of design for which one person must in the main be responsible. The whole work is largely due to the vision of Dr. C. G. G. J. van Steenis, and it is fortunate that he has also been enabled to undertake the co-ordinating work of General Editor. To his unremitting labour no less than to his breadth of knowledge is due the successful launching of this great enterprise. To the Government of Indonesia also much credit is due in these difficult times for undertaking a long-term project, and for recognition of its great importance as a survey of the plant life of the Malayan region.

The Malay Peninsula, which is included in the area covered by Flora Malesiana, will also benefit from this work. We are at present helping by loan of specimens from the Singapore herbarium, so that monographers may have an up-to-date local knowledge of available data concerning the plants they are studying. We hope also that some monographic study may be undertaken in Singapore.

We welcome the appearance of the first issue of Flora Malesiana, which is an outstanding event in the history of tropical botany, and express our congratulations to the Editor and our good wishes for the future success of his efforts.

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PUBLICATIONS OF THE BOTANIC GARDENS SINGAPORE

1. **The Agricultural Bulletin of the Malay Peninsula** (Old Series) nos. 1–9, 1891–1900 (out of print).

2. **The Agricultural Bulletin of the Straits and F.M.S.** (Second Series, monthly issues) Vols. 1–10, 1901–1911. Most numbers are available, price 50 cents each or $5 per volume.

3. **The Gardens Bulletin, Straits Settlements.**

   Vol. 1 nos. 1–5, January to May 1912 (as *Agricultural Bulletin of the Straits and F.M.S., Third Series*); nos. 6–12, December 1913–March 1917 (as *The Gardens Bulletin, S.S.*).

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   Vol. 4 nos. 1–12, June 1926–January 1929.

   Vol. 5 nos. 1–12, August 1929–June 1932.

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   Vol. 10 parts 1 and 2, January 1939–August 1939.

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